GROUP COMPATIBILITY AND BUDGET PREPARATION: An Empirical Study

by

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DEDICATION

Katie, Rachael and Joan...

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DECLARATION

I hereby declare that this thesis contains no material which has been accepted for the award of any other degree or diploma in any University and that, to the best of my knowledge and belief, the thesis contains no material previously published or written by another person, **except when due reference is made in the text of the thesis.**

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Mike Metcalfe

PREFACE

When people live together there will be 'personality' differences. These 'group dynamics' have been extensively researched in the psychology literature. Personality has also been well studied in its own right. As personality is largely only relevant when two or more people live or work in a group, these two research topics inevitably overlap. Using factor analysis techniques Schutz [1966] developed a 6 factor 'fundamental interpersonal relations orientation and behaviour' (FIRO-B) theory which resulted in the FIRO-B questionnaire. He argues that it incorporates most of the personality variables that are relevant to working in a group. Using the questionnaire it is possible to calculate a compatibility score between two personalities. In numerous pieces of experimental research a correlation has been found between these compatibility scores and the effectiveness of the group.

The behavioural management accounting research literature reflects the considerable interest being shown in the effectiveness of managers in accurately setting co-ordinated and demanding yet achievable, performance targets or standards. This organisational activity requires managers to work together in groups. It, therefore, seems reasonable that personality differences will affect their effectiveness. For example, the question of whether it is productive to allow managers to participate in setting their own performance standards has arisen. To a psychologist the answer to this question requires consideration of the personalities of the 'actors' involved. It is a compatibility issue. Some managers may wish to participate while others may want to be given clear commands. If these two preferred styles had to work together then compatibility problems would be expected. However, this 'personality differences' approach has not been extensively incorporated into the 'budget setting' research. Becker and Green [1962] suggested they should. These writers use the term group cohesion rather than compatibility. The difference between the two words will be discussed in chapter 3.

Problems of in-compatibility due to personality differences is only one type of compatibility, other have been identified. The ability level available within a group may affect its effectiveness, however, having a group consisting of members of widely differing abilities may cause problems. High ability group members may become intolerant of low ability members. The result may be time wasted on resolving compatibility conflicts rather than being spent on the group task. Therefore, ability mix has been identified as a source of incompatibility. Other sources of in-compatiblity have been reported in the cognitive styles literature, particularly with regard to the different ways people process information. When making a decision some people are methodical and thorough with any data available. Others will only give the data a cursory glance wanting to concentrate on strategies or idea creation. When people of such different styles work together then effort wasting in-compatibilities can arise. In summary then, in-compatibility has been reported in at least three forms, personality, ability and cognitive compatibility.

Organisational activity can be studied from the organisational perspective, the individual perspective and the small group perspective. Budgeting has mainly been studied at the individual level or as the relationship between the supervisor and the manager (dyads). There was need for more research at the small group level. With group compatibility issues, this meant using established research findings from psychology and applying them to the specific task of budgeting. The psychology literature, while acknowledging the possibility of a group being 'overly' compatible, tends to assume that in-compatibility problems will make the group ineffective. The management literature, however, has a large section interested in the problem of excessive compatibility. Janis [1972] has coined the term 'group-think' to describe this issue. The problem being that members of a small management group can become so compatible they fail to constructively criticise the groups actions. This suggests there must be an optimum level of group compatibility.

Most of the psychology research has construed experimental groups of various degrees

of compatibility and then studied their effectiveness. However, this by-passes the research question of whether people can anticipate in-compatibility. In a commercial budgeting environment the managers involved in can, to different degrees, influence the degree of group activity used in the task. They can decide on the percentage of time they will work alone compared to working face to face with the group. The personalities of the group will influence these choices. It may be that problems of in-compatibility can be avoided by group members selecting who they work with and how they work. The design of this research tried to reproduce these particular circumstances.

The study is laid out in the classic scientific method experiment design. After the introduction or overview it is argued that a small group perspective is useful in budget setting research. This is done by pointing out the empirical evidence that managers do work in this way and by identifying the advantages of group work to individual members. The style used in this study is to argue using the literature rather that simply provide summaries of all the recent literature. The end of the small group arguement introduces the issue of group compatibility. Ability compatibility is used. The following, third, chapter looks in some detail at Schutz's FIRO-B theory, his definitions of interpersonal compatibility and then summaries the literature that used his theory. The argument is that his theory is well developed and tested. The chapter goes on to introduce the concept of information processing cognitive styles and presents the evidence for the existence of cognitive in-compatibility. As ability also appears relevant to effective group performance it is discussed next. The fourth chapter argues how compatibility affects performance. Typically it is through motivation mechanisms, so the interpersonal compatibility aspects of the traditional motivation theories are highlighted. This section concludes the arguments supported by using previous literature. The chapter, therefore, ends with the hypotheses that will be tested to provide further evidence of the relevance of compatibility upon performance.

After discussing the perspective of experimental research in management accounting the Method chapter explains how the hypotheses will be tested. It also makes explicit the underlying assumptions and, therefore, maybe the limitations of this type of testing. Chapter six explains what tests are performed on the data and presents the numerical output of those tests. Given the recent trend towards providing descriptive statistics, these are provided where meaningful. Continuing in the scientism perspective the discussion of the results is presented in a separate final chapter. The chapter also makes suggestion for future research and then summaries whether the testing did in fact support the arguments that led to the hypotheses.

CONTENTS

CHAPTER 1: **INTRODUCTION**

BUDGET GROUP COMPATIBILITY

Operational budgeting is largely a cognitive task requiring managers to work in small groups. Its cognitive nature means that its accuracy and effectiveness is susceptible to the attitudes and motivations of the participating managers. As it is a group task, the participating managers will have interpersonal (social) experiences with other members of the group. The range of such interpersonal interactions is large and can considerably influence the level of motivation. For example, a person may lose motivation by being required to work with people of perceived lower ability. One member may prefer to work in a close group and encourage an intimate working style that does not suit another member. One member may have a strong need to control or dominate the other members and their actions. This may not suit the others. Some members may see the primary role of the group as being social or supportive, and become upset when they perceive disloyalty from others. One member may have a preferred way of dealing with problems and become annoyed with another's approach. The stress resulting from these interpersonal differences has been found to affect a group's overall performance significantly [Schutz,1966].

This field study investigates the impact of the compatibility[1] of the members of a small group on the performance of the task of preparing a budget. Due to the need for a large number of small groups and a controlled task, the study uses accounting students as surrogates for managers and a detailed computerised budget simulation assignment as a surrogate for a commercial budgeting task. The study is performed over seven weeks and simulates three budget periods. There are two main purposes of the study. The first is to test whether incompatible groups form when members have control over the composition of their group. The second is to investigate the

1. Compatibility is defined by Schutz [1966] as, 'works well with', see later.

relationship between any incompatibility and the group's performance. The forms of incompatibility to be considered include ability, interpersonal orientations and information processing cognitive styles.

The stimulus for the study came from a realization that budgeting had largely been studied at the individual or the organisational level. Much useful small group dynamics literature has not been considered. Typical of the individual level analysis found in the budgeting literature is that of Gull [1984]. Hoftstede's [1968] work is a typical example of budgeting research at the organisational level. The intermediate level of small group dynamics has been ignored. Tziner [1985] comments that this is usual for all the management performance literature. An exception is the dyad (pairs) work by Chenhall [1986]. The effect of interpersonal orientation on budget performance seems to be relevant to many of the issues usually considered important in management accounting research. These include motivation, control, feedback, participation and goal setting. The original work on these issues [Becker and Green,1962] acknowledges the interpersonal nature of budgeting, but with little more than a cursory reference to an undefined peer pressure. However, most of the more recent research into these issues has been at the individual level, and interpersonal considerations have been neglected. The results of this study should therefore clarify some of the problems involved in preparing a budget using a small management group. The results may also guide future budgeting researchers as to significant variables.

Small Groups in Management

Pokempner and Bailey [1970] report that most forecasting activity in organisations, which implicitly includes budgeting, is undertaken in groups. Goodman [1987] also comments that managers work in groups and that this is an obvious target for research. Sage [1981] has summarised the potential for group work in managerial tasks, and listed the advantages (see Chapter 2). Basic text books on budgeting refer

to the problems of managers working as a team. It seems appropriate , therefore, that budgeting research should also focus on the group level. Hare [1976] and Knoke and Kuklinski [1982] emphasised that large organisations are collections of small groups with three to five members. The informal network literature [e.g.Burt et al.,1983] has found that, regardless of the formal design of larger organisations, small co-operative groups form and that they effectively become the working group. There has been some discussion [e.g.Goldman,1971] about the appropriate size of these sub-groups and it is generally agreed that a group size of three to five is the most usual [e.g.Goodman et al.,1987] for managerial tasks. Small groups issues will be considered in chapter two.

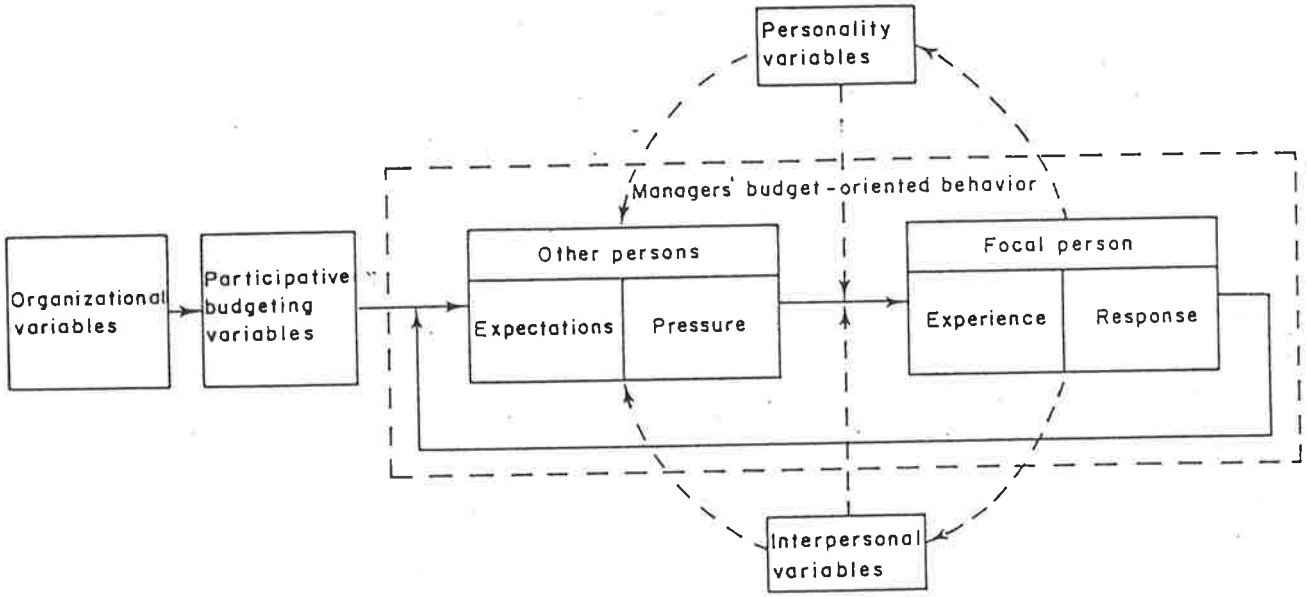
Self-selection To Avoid Incompatibility

How groups are formed is an important issue for research into management group compatibility. In most psychological research, the composition of groups is contrived. For managerial group compatibility research however, this may not always be appropriate. Direct labour groups may have less opportunity to determine who they have to work with, but managers usually have some discretion over the effective membership of their own work group. Managers can 'self-select' compatible co-members and avoid some of the problems created artificially in laboratory experiments. For managers working in smaller companies, or under a divisional structure, the first opportunity to form compatible groups occurs at recruitment. In the longer run, managers can formalise their preferred group by re-location, promotion and re-organisation. Alternatively, managers can self-select by creating informal sub-groups within their organisation [Knoke and Kuklinski, 1982] and effectively bar unwanted members. Greenberg's [1987] research on sample bias in management groups supports the argument that managers act to form compatible groups. He observed that the diversity of styles and personalities in any one organisation is often very limited. The extensive 'group-think' literature [Janis,1972] suggests that the practice is excessive. Many management groups become so compatible that they generate little

criticism of the group's performance. This can result in reduced performance. Given the extensive literature that has used contrived groups, and the special situation of mangement groups, it was decided that this study should use groups that are self-selected.

Alternative Compatibilities

Figure 1



Factors influencing budget-oriented behavior.

Swieringa and Moncur [1974] formulated a model (see Figure 1) of the budget related behaviour of managers. The model explicitly and implicitly refers to interpersonal and personality variables. In their study, Swieringa and Moncur [1974] used personality traits such as tolerance, trust and cautiousness and interpersonal variables such as leadership style and locus of control. However, factor analysis in the psychology literature [Schutz,1966] and the more recent management literature [Tziner,1986; Wegher et al.,1985] suggest that more appropriate variables which may influence group performance are members' ability [Tziner,1986], interpersonal orientation [Schutz,1966], and cognitive compatibility [McKenny and Keen, 1974]. This

study, therefore, elected to use these variables as interpersonal and 'personality' variables to relate compatibility to performance (hypotheses 2,3,4,5,6,7,8,9).

Ability

Ability is a complex variable, which has been well studied by psychologists [e.g.Cattell,1971]. Cattell [1971] accepts that ability effects performance but is unclear about the validity of the construct, ability. At one time ability was divided into specific and general ability. However, further testing suggested that there were personality and motivational aspects to ability. For example, a person with an interpersonal need to dominate other people may work towards satisfying this need by achieving high ability scores. In other words, abilty may be the result of a personality variable rather than being a personality variable.

There is little reported research on the relationship between ability mix and group performance in the management literature. One exception is Tziner's [1985] work on military tank crews. Unfortunately, Tziner's research is probably not relevant to budgeting research because his groups did not self-select and the operation of an army tank is not a similar task to budgeting. However, Tziner found that the group's mix of abilities was significant in affecting performance. Goldman earlier [1971], used paper and pencil tests, to report a non-linear synergistic effect. He found that groups composed of high ability members performed better than would be expected from a simple aggregation of their individual performances.

In this study, the second year management accounting examination results are used to provide a measure of ability (hypotheses 1c,2,7b,8,9). This is especially appropriate because it is an independent test, that is task specfic [Cattell,1971] and is undertaken by motivated subjects. Examinations measure a range of abilities; including memory, strategy formulation and motor skills which are very similar to those required in formulating a budget. Management accounting examinations test

students' grasp of basic budgeting techniques. As the task used in the study involve the formulation of a budget, examination results are a relevant measure of ability.

This study considers, inter alia, the degree of ability homogeneity of self-selecting groups. The degree of homogeneity is assessed by measuring the variances of the ability scores for each group. If there is a reasonable range of abilities within and between groups then the relationship between ability homogeneity and group performance can be assessed.

Interpersonal Orientation

Schutz's [1966] work on compatibility suggests that interpersonal orientations are an important influence on group performance. He found that a major determinant of group performance was the level of satisfaction of the group members' personal needs and wants. He demonstrated that groups composed of some members who wanted to work closely, and others who wanted to work as loosely as the task permitted, experienced enough tension to alter the group's performance. Schutz used factor analysis to develop an interpersonal instrument with three dimensions which he called Fundamental Interpersonal Relations Orientation and Behaviour (FIRO-B). The dimensions were inclusion, control and affection needs. Each of these was further divided into 'giving' or 'receiving'. The inclusion dimension is concerned with whether members want to include others in their work or whether they would rather work alone. The control dimension considers whether members want to influence others in performing a task. The affection dimension deals with the members' need to give or receive affection. Schutz developed a procedure for scoring group compatibility on each of these three dimensions. While this compatibility theory was developed with little reference to the research on cognitive styles, he believed that the performance of a group could be measured by his scores. Later research used groups with controlled membership and short trivial tasks [e.g.Reddy and Byrnes,1972] to support his theory. There are some doubts, however, about the linearity of the relationship. Some

studies, [e.g.Hill,1975] found that a small amount of incompatibility increased group performance, but that too much may be detrimental. This finding is consistent with the 'group-think' arguments of Janis [1972].

This study investigates the question of whether self-selecting groups form interpersonal incompatible groups (hypothesis 1a). This is done by analysing the descriptive statistics of the groups' compatibility scores. If incompatible groups do not form, then the question of group compatibility will be of limited relevance to managerial tasks such as budgeting which uses self-selecting groups. Schutz predicted that control and affection needs will slowly develop, but that inclusion needs influence group membership from the time of the group formation. However, consideration of the task to be performed is likely to overshadow concerns over interpersonal orientations when the group is formed [Schutz,1966]. Later, interpersonal orientations should grow in importance and may eventually affect performance. A reasonable range of incompatibility scores would be expected. The relationship between interpersonal compatibility scores and performance is also considered in this study (hypotheses 3,4,5,8,9). The relationship between ability and personality [e.g.Cattell,1971; Schutz,1966] will also be tested. Interpersonal orientation will be considered further in Chapter 3.

Information Processing Styles

At the theoretical level it is difficult to distinguish between personality and cognitive styles. However, there is increasing argument [e.g.Gul, 1984] that they are different. Schutz [1966] refered to one cognitive style instrument known as the Group Embedded Figures Test which McRay and Young [1990] tested against Schutz's instrument for concurrent validity. Of the six dimensions used in Schutz's FIRO-B instrument, "One FIRO-B measure of wanted affection correlated significantly, but only at 0.20, with scores on the Group Embedded Figures Test" [McRay and Young,1990]. This study assumes that the information processing cognitive compatibility theory measures a

different construct from the interpersonal theory. To test this, their intercorrelations will be studied (hypotheses 7a,9).

The Myers-Briggs instrument has been used to measure cognitive styles. However, it has clear personality aspects [Keen,1973]. It is considered more useful to concentrate explicitly on information processing cognitive styles, which are more relevant to budgeting problems [e.g.White,1984; McKenny and Keen,1974]. This study uses Keen's processing styles theory to identify and test for cognitive incompatibility (hypotheses 1b,6a,6b,6c,7a,7b,8,9).

It has been argued that differences in the processing styles of the designers and the users of computerised information systems is due to cognitive incompatibilities [e.g.White,1984]. The two groups appear to process information differently and are intolerant of each other's style. However, Huber [1983] has questioned the conclusions of much of this cognitive styles research. Keen [1973], who provided a method of measuring cognitive compatibility, argued that members without a strong cognitive style would act as intermediaries to reduce any incompatibility that existed between members with extremely differing cognitive styles. This study examines whether self-selection results in cognitively incompatible groups (hypothesis 1b). It is expected that groups with a range of processing styles will form. If there is a reasonable range of incompatibilities exists, then the association between cognitive compatibility and performance will be examined. Cognitive compatibility will be further considered in Chapter 3.

COMPATIBILITY AND OTHER BUDGETING VARIABLES

The literature on budgeting performance has paid particular attention to moderating or intervening variables such as participation [e.g.Brownell,1982], cohesion [Becker and Green,1962], slack [e.g.Onsi,1973], motivation [e.g.Schiff and Lewin,1970], goals [e.g.Locke et al.,1981], norms [e.g.Goodman et al.,1987] and feedback

[e.g.Luckett,1989]. Each of these variables implicitly or explicitly assumes group work. The interpersonal dynamics aspects of these variables were acknowledged in the early studies but were often neglected in later budgeting research. For example, French et al. [1966] in an early study of participation used a variable called 'independence needs' which has subsequently received little attention. Similarly many motivation theories acknowledge the importance of peer pressure. An interpersonal perspective may significantly change the understanding of some of these intervening variables. For example, it is possible that 'participation' really means allowing or disallowing interpersonal dynamics to operate. If group work is permitted, then compatibility of members would be expected to affect the group's performance. Later, the review of motivation theories will emphasise the early references to the interpersonal aspects of motivation. This will add support to the argument for studying budgeting as a group activity. The results of this study should assist in determining the significance of interpersonal dynamics in budget performance.

Feedback

The presence, direction and form of feedback affects managerial performance [Luckett,1989]. Budgeting is a repetitious task which is dependent on formal feedback reports (variances). Budgeting research should be, therefore, concerned with performance variables that are altered by feedback. Nadler [1979] highlights the additional problems of feedback to groups rather than to individuals. Both Schutz [1966] and Nadler [1979] suggest that positive or negative negative feedback to an incompatible group will increase the incompatibilities and cause time to be wasted in resolving incompatibility problems. Very incompatible groups may, therefore, be very sensitive to negative or positive feedback. On the other hand very compatible groups may protect each other from negative feedback, and minimise its effect. A very compatible group may even react to negative feedback by rejecting it . It is, therefore, hard to predict the impact of feedback on group performance. This difficulty extends to the magnitude of the impact and the subsequent direction of any

change in performance. This study is concerned with the effects of feedback on small group dynamics (hypothesis 8). The impact of feedback on groups with different compatibility levels will be studied by comparing the performance of the groups over three periods. The feedback is sufficiently detailed to allow the groups to identify the reasons for their performance. Feedback will be considered in more detail in Chapter 4.

METHOD

One hundred and sixty third year management accounting students at Otago University will be asked to arrange themselves into groups of no more than four members. The groups will be required to complete a detailed budget simulation task over several weeks. Group performance will be measured by the accuracy of their predictions of key variables (e.g. stock valuations). Motivation will be provided by assigning coursework grades assessed by reference to prediction accuracy and the achievement of a specified minimum return on investment (ROI). After completion of the assignment, the subjects will be asked to complete Schutz's interpersonal orientations instruments and Keen's cognitive styles instrument.

The budgeting assignment used in this research is the non-stochastic, simulation exercise designed by Goosen [1973]. Each group manages one small manufacturing company whose performance and actions do not directly affect any other group. The instructions include forty pages of information about cost structure and the behaviour of the simulated company in its marketing, production and financing functions. For example, it includes details of product costings, machine speeds, replacement costs and running costs and the impact of price, stock-outs and marketing policies on sales levels. It also includes details of the costs of various sources of capital.

The task requires each group to make twenty five decisions about resource allocation

in each of the three periods. For example, each group must decide how much it will spend on advertising, wage rates and new machines. The groups must also determine capital requirements, credit periods and planned production units. The groups submit a list of their decisions and the outcomes (forecast) based upon these decisions. If they understand the data and process it correctly it is possible to achieve the 'right' outcome.

The decisions will be submitted to Goosen's computer program which is a formal algorithm of the details given to the groups in the instructions. Based upon the groups' decisions, the program produces a detailed manufacturing profit and loss account, balance sheet and some management statistics which are returned as feedback. The groups will have three weeks to make the first submission and two weeks for each of the remaining two submissions. The groups arrange their own inter-group consultations. They will be required to submit a set of decisions for each of the three budget periods.

The three sets of outcomes will consist of sales revenue, ROI, closing accounts payable and the material stock quantity that should result from the operational decisions. The outcomes will then be compared with the output from the computer. The adjusted mean absolute percentage error (MAPE) will be used as a measure of the total error between the groups' calculated outcomes and the correct ones obtained from the computer. MAPE will be used as the measure of each group's performance.

Surrogation

This study is concerned with the relationships between ability, interpersonal orientations and cognitive style and the performance of commercial managers in a budgeting task (Hypothesis 9). It will use a computer simulation as a surrogate for budgeting and students as surrogates for managers.

The simulation is a surrogate for only part of the budgeting task. It concentrates more on the planning aspects than the control aspects of budgeting. The groups are given the data and the inter-relationships between the variables. They have no implementation problems. However, data collection and the implementation of decisions involve even greater interpersonal contact, so the findings should be generalisable to other aspects of budgeting. The simulation is a realistic surrogate for a cognitive calculation task that overloads the groups with information. The groups must decide if the advantages of a division of labour justify the communication and interpersonal problems which are likely to result. Members have little control over the performance of other group members and must devise strategies both to subdivide the task and to evaluate each others' performance. This situation is typical of the role of accountants in budgeting. The simulation also involves devising and evaluating performance strategies such as deciding the means of achieving the target ROI. The simulation is a considerable improvement on the use of manual or 'paper and pencil' tasks. It will usefully generalise the psychology experiments to a more realistic cognitive task.

The study will use accounting students to deal with that part of the budgeting, which they mostly associate with cost accounting. This includes co-ordination, information processing and strategy formulation. With the exception of attitudes, Ashton and Krammer[1980] found that students were useful surrogates for managers. In addition, Schutz and Keen both stated that the characteristics with which they were concerned are stable over long periods of time. As the present student population is a future sample of managers, little sample bias is expected. Greenberg [1987] points out that students can be a better representative sample of managers in general than 'real' managers from any one company or one industry because they tend to become a homogeneous sample. It is also relevant to note that accounting students rather than students in general are being used as surrogates for managements. Some selection has already occurred. The research can be thought of as a pilot study, a retest, or as a generalisation of tests on managers. The former seems to be the most appropriate.

Students have been used in experiments reported in the major accounting journals [Elias,1990] with increasingly less justification [Schatzberg,1990] to readers.

HYPOTHESES

The thesis will test the following formal hypotheses. The first group of hypotheses is concerned with group formation.

Hypothesis 1a.

Ho. That if group members are allowed to self select then they will not form interpersonal compatible groups.

Hypothesis 1b

Ho. That if group members are allowed to self select then they will not form groups of similar cognitive styles.

Hypothesis 1c.

Ho. That if group members are allowed to self-select then they will not form in any consistent manner with regard to ability.

The second set of hypotheses is concerned with group mix and performance.

Hypothesis 2.

Ho.That the particular mix of the group with regard to ability will have no effect on forecast accuracy.

Hypothesis 3

Ho.That there is no association between a group's total score on inclusion and its forecast accuracy.

Hypothesis 4

Ho. That there is no association between a group's total score on expressed control and its forecast accuracy.

Hypothesis 5

Ho.That there is no association between a group's interpersonal compatibility and its forecast accuracy.

Hypothesis 6a.

Ho.That there is no association between the mix of a group, with regard to cognitive style, and its forecast accuracy.

Hypothesis 6b.

Ho.That there is no association between a group's total score on any particular cognitive style and its forecast accuracy.

Hypothesis 6c

Ho:That there is no association between a group's highest score on any one particular cognitive style and its forecast accuracy.

The next group of hypotheses are concerned with the inter-relationship between variables.

Hypothesis 7a

Ho. That there is no association between cognitive style and interpersonal orientation.

Hypothesis 7b

Ho. That there is no association between cognitive style and ability.

Next the issue of feedback is considered.

Hypothesis 8.

Ho. That any association between compatibility and forecast accuracy will not increase given feedback, regardless of the group's previous experience or ability.

Performance

Group performance is expected to be a function of ability, compatibility and the application of the appropriate cognitive styles. The last hypothesis combines the others and considers whether peformance is associated with ability, interpersonal orientations, cognitive style or any compatibility associated with these variables.

Hypothesis 9

Ho. That forecast accuracy is not dependent upon a groups mix with regard to ability, interpersonal compatibility, or cognitive compatibility.

STRUCTURE OF STUDY

This introduction has briefly mentioned some of the topics covered by this study. The second chapter argues the relevance of small group research and considers some of the issues. These issues include why groups should be studied, how a small group is defined, when small groups out-perform individuals and the additional problems introduced by working in groups. The third chapter explains the usefulness of the three compatibility variables, interpersonal, cognitive and ability. The fourth chapter argues that group compatibility is relevant to many issues that have been studied in the budgeting literature. These variables include participation, motivation, slack, feedback and goal setting. The chapter also explains how compatibility affects performance. The fifth chapter explains the method used. The 'experiment' is explained, the usefulness of students as surrogates further argued and

the performance variable is justified. The sixth chapter explains how the data was analysed, and presents the tables of results with minimum comment. The last chapter discusses the results in the context of the discussion contained in chapters one to four. Suggestions for further study are followed by the conclusions.

CHAPTER 2: SMALL GROUP RESEARCH

Work Group Size

This section considers the relevance of small group composition to budgeting research. Goodman et al. [1987] state that a: "...recent review of the literature clearly demonstrates the large volume of studies over time and the breadth of research over different types of groups". This study, like much of Goodman et al., is restricted to organisational or managerial work groups. This makes the relevant literature less voluminous. However, this study differs from much of the organisational group research in that the considered group task is planning not production.

There are many definitions of a group. For example, May [1987] defines a social group as "individuals in relationships". Our concern is with work groups and his definition leaves unanswered the questions, how many individuals, in what sort of relationships? Steadman [1980] emphasises the "span of time" aspect of groups. He defines a group as, "a relatively small number of individuals who have mutual relations with each other over a span of time". Vecchio [1988] feels that self perception is an important factor in defining a group. They have to feel like a group. Vecchio's definition is, "two or more people who interact with each other, share common beliefs, and view themselves as being members of a group". Goodman et al. [1982] provides a fuller definition of a human group. A group is, "a collection of individuals (1)who have significantly interdependent relations with each other, (2) who perceive themselves as a group by reliably distinguishing members from non-members, (3) whose group identity is recognised by non-members, (4)who, as group members acting alone or in concert, have significantly interdependent relations with other groups, and (5)whose roles in the group are therefore a function of expectations from themselves, from other group members, and from nongroup members." Applbaum [1974] takes the different approach and introduces communications. A group is, "two or more people communicating face-to-face with each member aware of the presence of each other member within the group".

However, Hare [1976] uses this definition to distinguish a large group from a small group. Hare concludes that there are two types of groups. They either work on a common task or satisfy some personal needs. He defines a group as a collection of people with a common task or compatible personal needs. Vecchio [1988] and Goodman et al. [1987] concur with the importance of concentrating on tasks and needs.

In the literature, groups are usually classified as "small" or "large". A group of two members is clearly small and a corporation is clearly a large group. However, the criteria for distinguishing between small and large groups are poorly defined. Hare [1976] suggested a classification basis using communication style, and the strength of the leadership role. Where there are up to four in a group, each member usually directly addresses the others and makes a significant contribution to the group's discussions. This is probably because for a group of four there are only six [(n/2)(n-1)] possible pairs of interaction. No one talks "through" another and all communication is direct. Sub-groups may still form but, with a group of four, each member still only has to deal with a maximum of thirty seven $[1/2(3^n-2^{n-1}+1)]$ people or sub groups. However, the relationship between group size and the number of possible interactions is non linear. For example, if the group has seven members, then 966 people or possible subgroups may have to communicate. Hare [1976] suggests that this is a reason why leadership is more important for larger groups. Effective leadership reduces the need for an individual member to communicate with a large number of sub groups. For a large group, communication networks are necessary. These networks have key nodes (liaison persons) and communication paths. Cliques (inner circles) will usually form [Knoke and Kuklinski, 1982]. For example, a clique of senior managers would be expected to form in most organisations [Parkinson,1957]. Cliques effectively reduce a large group into a collection of small groups. Hare [1976], therefore, defined a small group as one which has direct communication among all members, with no cliques and liaison persons. He also emphasises that a large group can be viewed as a collection of small groups whose size is also determined by this communication principle.

Horngren and Foster [1987] recommend a budget committee of four. Drury [1988] recommends that "the budget committee should consist of high level executives". This suggests a small group. Both authors also recommend a high level of negotiation with work groups when standards are being set. This reflects the implicit assumption that budgeting involves the interlocking [Likert,1961] of a hierarchy of numerous small groups, with each group being responsible for its own section of the overall plan. However, apart from suggestions about the size of the group administering the budget Siegel [1989] points out that there is very little discussion about what group size is used, or intended, in budgeting. As mentioned, the sociometric network literature has found that in many commercial settings, large groups devolve into informal cliques. Budgeting is expected to be a typical example of this process. Ezzamel and Hart [1987] suggest that if meaningful (non-pseudo) interaction is sought then the groups involved in budgeting should be small. The literature therefore suggests that budgeting is a small group activity.

Optimum Small Group Size

The optimum size of small groups has been extensively studied. The conclusion is that a group of three to five is the most productive but this is dependent on the task and the ability of members [Hare,1976]. For example, Trist and Bumford's [1951] study of mining, a manual task, found that groups of three were, pro-rata, more productive than groups of forty to fifty. Yetton and Bottger [1983] used the NASA moon exercise (a cognitive task) to study the effect of group size on performance. They concluded that, "it would be difficult, at least with respect to decision quality, to justify groups larger than five members". Libby and Blashfield [1978] studied the effects of group size on the accuracy of predicting business failure and graduate admissions. They concluded that a group size of three is optimum. Huber and Delbecq [1972] suggest that optimum group size is at least five while Hogarth [1980] argues that it is at least six.

However, Goldman [1971] and Yetton and Bottger [1983] point out that members' ability is a moderating variable between group size and performance. Goldman [1971] used a paper and pencil learning task to demonstrate interaction between group size and members' ability. The performance of low ability groups improved significantly when the size of the group was increased from two to five members. Medium ability groups showed an irregular improvement in performance with increases in group size. While the performance of high ability groups declined with increased group size. Yetton and Bottger [1983] used the NASA moon exercise to show that there were declining gains from increases in group size with no improvement in performance with groups of more than four. On the other hand, groups with high ability members had a stronger relationship between performance and size than groups with lower ability members. Egerbladh [1976] used an IQ test to find that higher ability students gained more from membership of small groups than low ability students. He called for more attention to ability in small group research. Laughlin et al. [1975] also found that ability was a significant variable in small group perfomance of an intellectual task.

Groups v's Individuals

The rhetoric on groups is typified by Hughes' [1965] assertion that problem solving in groups leads to mutual recognition of the group's problems, improved communication between group members, and/or improved group "harmony" in achieving the goals of the group. However, the empirical evidence suggests that the relationship between group participation and performance is much more complex.

Sage [1981] more usefully summarized the potential advantages and disadvantages of groups as compared to individuals.

> "Since a group has more information and knowledge potentially available to it than any individual in the group, it should be capable of making a better decision than an individual. Group decisions are often more easily implemented than individual decisions since participation will generally increase decision acceptance as well as understanding of the decision. Also group participation increases the skills and information that members may need in making future organisational decisions. On the other hand there are disadvantages to groups. They consume more time in decision making than individuals. The decisions may not fully support higher

> organisational goals. Group participation may lead to unrealistic anticipations of involvement in future decisions and resentment towards subsequent individual decisions in which they have not participated. Finally, there is no guarantee that the group will converge on a decision alternative".

The empirical literature suggests that individuals often outperform groups. This is especially true in "brain storming" and in problem solving tasks when performance is measured by reference to the total hours consumed. The sum of the results of the attempts of independent individuals is greater than the sum of the results of the attempts of a group divided by the number of members in the group. For example, Kaplan et al. [1950] asked twenty six subjects to make over 3,000 separate forecasts based on sixteen events in the social and natural sciences. They found that participation in a group of four followed by individual forecasts resulted in 62% of correct forecasts. Individuals working alone and statistically averaged as four person groups were correct in 63% of the cases. Group participation did not improve accuracy. When Jenness [1932] asked subjects to estimate the number of beans in a jar, participation led to consensus but did not improve accuracy. Campbell [1968] used a management planning problem to compare the performance of individuals, with and without group discussion, and a group solution. He used managers in a public utility company. He concluded that, "Group discussion did not improve individual problem solving efforts; group solutions tended to be of significant lower quality. There also tended to be a negative correlation between solution quality and orientation towards maintaining group interaction"[Campbell,1968]. Rohrbaugh [1979] used predictions of the scores of first year undergraduates to compare the performance of groups and individuals. The group meetings did no better than the average of the individuals. Borman [1982] compared group performance predictions of army recruits with individual predictions and found that the individual predictions were better on a per hour basis. Dalkey [1967] found that individuals outperformed groups on almanac questions. Yetton and Bottger [1983] added a refinement. They identified the "best-member" of a group and demonstrated that this person outperformed the average group performance.

The tasks and the situations used in these studies should be noted. There were no problems of implementing change and the groups did not have to work together over a long period on subsequent problems. Longer periods of association introduce other rationals for group activity [Sage,1981]. They serve a social role [Boje and Murnighan,1982], they provide feedback on satisfying levels [Simon, 1957], they provide satisfaction from being part of a decision making group (this may be largely ritualistic, [Gimpl,1984]), they assist in gaining commitment for implementation [Armstrong, 1985], they provide the opportunity for the group to perform as well as the most able member [Yetton and Bottger, 1983], they provide motivation through peer interaction [e.g. Maslow,1943] and they may provide a useful way of trading information in an iterative process. In addition, feedback from functional experts is required when dealing with a complex collaborative organisational task. A group may also be an efficient way to facilitate this feedback [Naylor,1979].

Using groups in budgeting research is justified on the basis that most planning and forecasting activity is undertaken in this way. "One simple rationale for trying to learn more about groups is that they are pervasive in organisations" [Goodman et al.,1987]. Forecasting in commercial organisations is usually a small group activity [PoKempner and Bailey,1970]. It is so pervasive that many management accountants are unaware that they have chosen one forecasting method from a range of alternatives.

In summary, there is some evidence that using groups for forecasting tasks is not warranted on the grounds of accuracy or error avoidance. However, there are other advantages from using groups in organisational settings. Despite the arguments for and against groups, they are commonly used in forecasting and planning tasks. This suggests that the members perceive that the benefits outweigh the problems. It would be useful research, however, to identify the major variables that make a group productive. This would reduce the negative attributes of group work.

Group Problems

The study of small groups implies a study of their composition. Tziner [1986] has reported a lack of research into the effect of group composition on group performance in the management literature. "Small group research now, as then, has tended to focus on groups established to satisfy members' own sociopsychological needs rather than on production. The few attempts to assess more outwardly directed performance outcomes have been circumscribed to experimentally contrived groups, dealing with simplistic tasks requiring little coordination or communication". Tziner [1986] distinguishes between collaborative and co-ordinated tasks. The former is a common or joint task, while the latter is where each member has a sub-task which is co-ordinated with the other members' tasks to perform an overall group task. This overall group task will also require input from the individual members. He suggests that most managerial tasks are co-ordinated tasks. Members have their own sub-goals but are also working towards a group goal. For example, in budgeting the sales manager must prepare the sales budget which co-ordinates with the production and the stock budgets. This distinction also demonstrates how group work introduces complexities which are not relevant to tasks performed by individuals.

While numerous models of group effectiveness have been developed [e.g. Kolodny and Kiggundu,1980;Hachman,1983; Guzzo,1984; Gladstein,1984], Goodman et al. [1987] are critical. They believe that the models are too general, that the inter-relations of variables are poorly defined, that they are not empirically tested and that they do not put enough emphasis on dependence on the task (technology). They recommend that work group research should concentrate on task and cohesion. The task of budgeting has been identified as a unique and specfic. Cohesion, repesents the social-psychological variables mentioned above in the group effectiveness models. Goodman et al. [1987] comment that cohesion is not well defined: they identify at least two aspects of cohesion which are task cohesion and affection cohesion. Affection cohesion has been associated with compatibility [Schutz,1966]. Schutz found that the

two variables were correlated. This correlation supports his theory that compatibility leads to cohesion. Schutz presents a thorough theory of compatibility which is discussed in the next section. As compatibility has been more thoroughly defined and empirically tested than cohesion, it will be used in this study.

Other authors on group performance suggest that the major variables influencing group performance are the ability of members [Tziner,1986], the interpersonal compatibility of the members [Schutz,1966], and the cognitive compatibility of the members [McKenny and Keen, 1974]. This seems to be inconsistent with Goodman's [1987] comments. Many of the other variables that have been studied in group performance can also be associated with ability, interpersonal orientation or cognitive compatibility. For example, Hackman and Morris [1975] tested ability, effort and the development of strategies. Effort was correlated to motivation. The internal (intrinsic) aspects of motivation are a personality variable [Ronen and Livingston,1975] which can be measured by interpersonal orientation. For example, one interpersonal variable, the need to control others, is a strong motivator. Effort may be adequately measured by this interpersonal dimension. Hackman and Morris also considered the development of strategies. They found that groups that developed a definite plan (strategy) were more successful than groups that did not. The goal literature [e.g.Locke et al.,1981] agrees that this is an important determinant of performance. In this study the task of budgeting is used. Budgeting is a performance strategy. Therefore, this study will not test strategy development as in non-budgeting studies. Ability, inter-personal orientation and cognitive compatibility are far more pervasive than those variables studied by Hackman and Morris, and are more suited to measuring inter-group dynamics.

Compatibility

Compatibility is a performance variable which is not considered when budgeting is researched at the individual level. It is an important characteristic of an

effective group. It leads to cohesion[1] [Schutz,1966] which, in turn, improves performance[2] [Becker and Green,1962]. Compatible groups do not spend time resolving differences between members [Schutz,1966]. Schutz found that interpersonal compatibility resulted in group performance which was significantly different from the sum of the performances of the individuals in the group. However, compatibility may be interpreted and measured in several ways. Other examples include ability-mix compatibility, and cognitive compatibility. Schutz [1966] has a well developed theory of compatibility which is reviewed in the next chapter.

The impact of group compatibility has also been considered in the management performance literature. One approach uses similarity theory [Nahemow and Lawton, 1983] which suggests that "likes like likes". 'Similar' members, it is argued, will be compatible. Nahemow and Lawton [1983] suggest that similarity, in a wide variety of physical and psychological dimensions, facilitates effective group performance. However similarity does not mean the absence of a necessary trait. If no member has a particular ability or skill which is necessary to perform an essential task, then the group's performance will suffer.

Group performance resulting from different group compositions as predicted by similarity theory are presented in a Table 2.1 [Tziner,1986]. A represents the presence of one characteristic, B represents another.

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1. Cohesion is defined by Goodman as binding of the individual to a group, see later.
2. Performance is defined as the achievement of goals.

Table 2.1: Similarity Theory Comaptibility

Group Composition	Group Compatibility	Group Performance
A A A	Compatible	Positive
A A B	Incompatible	Negative
A B B	Incompatible	Negative
B B B	Compatible	Positive

Compatibility is predicted to have a positive effect on performance while incompatibility is expected to have a negative effect on performance. Compatibility in similarity theory thus requires a successful group to be composed of similar members. However, Schutz [1966] and Keen [1973] argue that compatibility is more complicated than suggested by similarity theory and that it is possible for dissimilar members to complement ("dovetail") each other. For example, Schutz demonstrated that if a submissive person worked with an authoritarian person then the synergistic effect was greater than if two authoritarian persons worked together. Keen [1973] questioned how similarity theory would predict the performance of a group made up of members with three different characteristiscs. That is, he pointed out that the theory was only two dimensional. He studied the compatibility of extreme cognitive styles and argued that the presence of a third characteristic may moderate incompatibilities between two other members.

White [1984] studied cognitive compatibility between groups of computer system designers and system users. She found that compatibility required the designer group to demonstrate the presence of the whole Jungian range of personalities. This result is also inconsistent with similarity theory approach.

Similarity theory is also challenged by Yetton and Bottger [1983]. They found that compatibility and performance depended upon the group's most able member.

Compatibility, here, required that one member of a group was dissimilar to the others in a relevant characteristic, ability. This approach implicitly assumes that the most able is recognised by the other members and that he/she wants the dominant role. The rest of the group assists the most able member and produces a group performance that exceeds the performance of the most able member and the sum of the performances of all the members.

Compatibility and Performance.

Schutz [1966] and others have found a correlation between group compatibility and the performance of that group. The reason for this relationship is less clear. Shaw [1983] and Schutz [1966] both argue that compatible groups waste less time on arguments. They also suggested that compatible group members have higher levels of need for peer recognition and support and that these needs were satisfied. The compatible group members are more motivated to please the other members. These advantages might make a compatible group more efficient but for the group to become effective this efficiency must be directed. The setting of goals is one way of changing efficiency into effectiveness [e.g.Harrell, 1977; Locke et al.,1981]. They found that goals give direction to a compatible group's actions and that they motivate in their own right. The issue of goals is further discussed later. The level of the motivation is predicted by theories such as the Equity Theory [Ickes,1985; Rockness,1977]. This theory argues that motivation levels are determined by the perceptions of the likelihood of achieving the goal, the effort required to achieve the goal and the importance of achieving the goal.

Equity theory also suggests how member interaction may work. Within the group, members compare themselves to each other. They compare their "input to output" ratios. If one member perceives that others are receiving too much reward for the input they have made, then there will be feelings of inequity. The responses to these feelings of inequity are contingent, and personal, depending on whether members are

internal or external reward (valences) dominated. The level of response reflects the level of motivation. The theory suggests that members will either try to influence the actions of other members or adjust their own performance.Tziner [1986] presents a table contrasting performance predictions resulting from equity theory with different group compositions. A represents a high output to input ratio, B represents a low output to input ratio.

Table 2.2: Equity Theory Compatibility

Group Composition	Group Performance
A A A	Neutral
A A B	Positive
A B B	Negative
B B B	Neutral

The table shows that Equity theory suggests that if one member of a three member group is inefficient then he/she will be encouraged to conform by the others. On the other hand the majority are inefficient, the efficient minority will be encouraged to become inefficient and to conform. This assumes that the strength of the members' personalities ensures that the group will conform to the will of the majority.

A compatible group is expected to make these "adjustments to performance" in a supportive constructive manner. For example, a member who is perceived as receiving too much reward (output) in relation to contribution made (input) would increase his/her inputs in an attempt to please the other members. Alternatively the other members may assist this member to improve his/her inputs. Incompatible groups are expected to respond to any differences between a member's input and output in an aggressive manner which wastes time and reduces social bonding. These issues are further discussed in chapter 4.

Group Organisation

Apart from the compatibility of a group, its performance will probably be influenced by its organisation or administration. Organisational factors include the setting of goals, the presence of a leadership hierarchy and the extent and form of feedback. In general, the empirical forecasting literature suggests that the management of compatibility is a more important determinant of performance than the presence of a strong leader. Maier and Maier [1957] used a personnel management problem to test whether a group performed better if the role of the leader was minimised. They found that it was preferable if the group had an assistant (facilitator) rather than a leader. The role of the facilitator was to reduce problems arising from the incompatibility of group members. So, for example, they argued that group performance would be enhanced by the facilitator encouraging "minorities" to express themselves. Another way in which incompatibilities can be managed is by mimimising evaluation. Hall [1971] used the NASA moon exercise to demonstrate that suspension of evaluation and the encouragement of minority views improved the accuracy of preditions. Herbert and Yost [1979] repeated Hall's experiment with the same results. Hall [1963] used the film "Twelve Angry Men" to ask groups to predict the order in which the jurors would change their votes. They found that the absence of a dominant leader was beneficial. This finding was confirmed by Holloman and Hendrick [1972]. The leadership role is contingent upon the task and the means of power. In budgeting, the input of specialist knowledge is essential. As educated, professional managers are using their creative abilities, dominant leadership will not be as relevant as it would be with many tasks used in management research. It is, therefore, suggested that the issue of group leadership is not as relevant in the context of budgeting as it may be in some other types of group research.

Schutz [1966] suggests that leadership will be relevant only if it is wanted. He sees leadership as a control need or want. Some members may want to lead, others may not. Some members may object to someone trying to lead, while others may want a strong

leader. If the group is incompatible in terms of leadership (control needs) then they will waste time dealing with the resultant incompatibility problems. Leadership will only be useful if the group is compatible on control needs and wants. This is discussed further, later in this thesis.

Role playing is an exercise in managing compatibilities. Group meetings conducted in this way confuse, or allow the suspension of the normal composition of a group. Armstrong [1985] concludes that "..the preceding evidence on actual situations provides much evidence favoring role playing". If a group is incompatible, then role playing appears to be useful. However, if the group is compatible the suspension of this compatibility by role playing would reduce the opportunity for compatibility to operate in a positive manner. If administration methods that reduce incompatibility have an effect on the group performance, then this provides further suggestion that compatibility must be relevant to group performance.

Summary

The chapter has outlined why small groups are used despite a lack of any clear evidence of 'immediate' performance gains. The effectiveness of groups appears contingent on many factors. This study concentrates on the interpersonal factors using the general term 'group compatibility'. Some of the simpler theories on compatibility were outlined. In the next chapter compatibility is considered in greater detail. Chapter four considers how compatibility might improve performance.

CHAPTER 3: GROUP COMPATIBILITY MEASURES

[A] INTERPERSONAL COMPATIBILITY

Interpersonal orientation

This section argues the usefulness of interpersonal behaviour as a predictor of group performance. It uses the Fundamental Interpersonal Relations Orientation and Behavior (FIRO-B)[1] theory developed by Schutz [1966]. Compatibility is defined, and its association with cohesion and task interaction levels is considered. Lastly, the research on compatibility is summarised.

The literature on interpersonal orientation is dominated by the Fundamental Interpersonal Skills Orientation - Behavior Instrument (FIRO-B) which was designed by Schutz [1966]. The importance of Schutz's work is illustrated by Shaw's [1983] comment that, "group composition has been analysed most completely by Schutz". Schutz outlines the background to and the development of the instrument in his monograph *The Interpersonal Underworld* [1966]. By the end of the 1950s many variables had been found to be relevant to interpersonal behaviour [Hare,1976]. Factor analysis was often used to cluster these variables into a few dimensions. While there were differences in terminology the results often were generally consistent.

Schutz [1966] postulates that: "(a)every individual has three interpersonal needs: inclusion, control and affection; (b)inclusion, control, and affection constitute a sufficient set of areas of interpersonal behavioural phenomena". Schutz's dimensions have been repeatedly validated and his instrument was selected for this study. He was specifically concerned with performance and developed a clear theory of compatibility which are both relevant to budgeting research. His dimensions are similar [Hare,1976]

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1. An interpersonal orientation is assumed to lead to interpersonal behaviour. It is important to Schutz to distinguish between behaviour and feeling. An orientation must be strong enough to alter actual behaviour not merely invoke some feelings.

to those found by other researchers on interpersonal orientation [Chapple,1953;Couch and Launor,1952;Leary,1957;Bales and Cohen,1979; Lustig,1987]. Schutz was specifically concerned with behaviour and not with feelings or attitudes. He was interested in the actions that resulted from feelings. The feelings orientations have to be strong enough to evoke a behaviour.

Schutz defined *interpersonal need for inclusion* as, "the need to establish and maintain a satisfactory relation with people with respect to interaction and association'[1966,p.18]. He commented that "...terms that connote a relation that is primarily positive inclusion are associate, interact, mingle, communicate, belong, companion, comrade, attend to, member, togetherness, join, extrovert. Some of the terms that connote lack of, or negative inclusion are exclusion, isolate, outsider, outcast, lonely, detached, withdrawn, abandoned, ignored'[p.21].

The *interpersonal need for control* is defined as, "the need to establish and maintain a satisfactory relation with people with respect to control and power" [p.18]. He also wrote that: "..terms connoting a relationship that is primarily positive control are power, authority, dominance, influence, control, ruler, superior officer, leader. Some terms that connote primarily a lack of, or negative, control are rebellion, resistance, follow, anarchy, submissive, henpecked, milquetoast" [p.22].

The *interpersonal need for affection* is defined as, "the need to establish and maintain a satisfactory relation with others with respect, love and affection [p.20]. "Some terms that connote an affection relation that is primarily positive are love, like, emotionally close, positive feelings, personal, friendship and sweetheart. Some terms that connote primarily lack of, or negative, affection are hate, cool, dislike, emotionally distant" [p.24].

The three dimensions of interpersonal behaviour were each divided into "expressed" and "wanted'components. The table below [p.59] outlines the differences.

Schema of Interpersonal Behaviors

Expressed Inclusion (ei): I initiate interaction with people.

Wanted Inclusion (wi): I want to be included.

Expressed Control (ec): I control people.

Wanted Control (wc): I want people to control me.

Expressed Affection (ea): I act close and personal towards people.

Wanted Affection (wa): I want people to get close and personal with me.

The "expressed" behaviour refers to an originator. The "wanted" behaviour refers to a receiver. These six scales are non-independent. Shutz reports intercorrelations as listed in the Table 3.1.

Table 3.1: Intercorrelations

	wi	ec	wc	ea	wa
ei	.62	.15	.12	.46	.31
wi		.10	.13	.49	.48
ec			.25	.17	.00
wc				-.02	-.15
ea					.70

Source: Schutz, FIRO-B, 1966, p59.

To test the dimensions Schutz [p.54] presents his theorem 1.1 that "If a representative measure of interpersonal behaviour is factor analysed, the resulting factors battery will reasonably fall into three need areas, inclusion, control, and affection". The battery of measures he used included:

(i)Slater's Parental Role Preference (PRP) questionnaire;

(ii)Blacky's projective test based on Freud's psychosexual stages (B);

(iii)Edward's Personal Preference Schedule (PPS);

(iv)The interpersonal checklist (IPC) based on the Kaiser scheme;

(v)Guildford Rhathymia (R) and Cyclothymia (C) scales;

(vi)The California F-scale (F);

(vii)Blacky's Defense Preference Inquiry (DPI);

(viii)The FIRO-1 instrument.

The results showed high correlations between the FIRO questionnaire and the other questionnaires as indicated below.

Cluster 1. I am a High Participator in a Group [inclusion]; IPC.

Cluster 2. I Want People To Take Good Care Of Me [inclusion]; PPS.

Cluster 3. I Do Things The Way They Should Be Done [control]; PPS, DPI, and B.

Cluster 4. I Am Friendly towards People [affection]; B, and PPS.

Schutz indicated that other clusters which included the FIRO questionnaire were also found but merely commented that they are difficult to interpret.

It is generally assumed that interpersonal orientations that lead to behaviours are developed early in life and remain largely unchanged. They should, therefore, be related to all adult situations where the interpersonal relations are significant. Schutz [p.66] tested his inter-personal orientation theory by demonstrating that those who scored high on the wanted inclusion scale believed that the individual was significant and supported autocratic behaviour in politics. This was the expected result as high wanted inclusion scores should indicate a willingness to be manipulated by others in a group. Those scoring high on the expressed control scale tended to manipulate people and to have the attitude that the political power of others should be abdicated or minimised. This result was also expected as a high control score indicates a desire to control others. However, the affection scale comparison with

whether political figures should be friendly was not significant. This result was not expected and was not explained by Schutz.

In a comparison of interpersonal behaviour and career choice Schutz found that nurses scored highly on the affection scale and military officers scored high on the control scales. This result was expected.

Schutz also tested the relationship between interpersonal behaviour and conformity with peer pressure. The results showed that the people who most resisted group pressure were high participators who did not feel the need to be liked (high inclusion, low affection). Those who changed their minds under peer pressure tended to like strict rules (wanted control).

Schutz tested the stability of interpersonal scores over time by demonstrating that they were deeply rooted in parental influence. He presents theorem 2.1. "There is a positive covariance between reports made by an adult of his childhood relations with his parents, and his present behavior in the areas of inclusion, control and affection'. The results of his tests indicated a significant association between parental attention and the child's participation needs, parental discipline and the child's autocratic behaviour; and parental behaviour and the child's personal closeness. The issue of stability is important for both the design of studies on group performance and the stability of experimental results over time in commercial settings. If interpersonal orientation is stable then results found in this are likely to be generalisable. In addition, it suggests that it may be unproductive to try to change members' behaviours.

COMPATIBILITY DEFINED

The central theme of interpersonal behaviour is compatibility, which Schutz defines as "works well with" [p.106]. He outlines the significance of compatibility in his

Postulate 3: "If the compatibility of one group, h, is greater than that of another group, m, then the goal achievement of h will exceed that of m" [p.105]. He also accepts that, ultimately, compatibility is defined by the way it is measured. Ickes [1985] described compatibility as satisfaction. He also suggested a more complete definition: "the integrative functioning of the relationship operationally defined in terms of the individual's capacity to reach consensus, meet each other's needs, facilitate each other's goals, resolve conflicts, etc."

Schutz proposes three different types of compatibility all of which are applicable to each of the three interpersonal dimensions. There are, therefore, nine measures in all. Schutz's types of interpersonal compatibility are reciprocal compatibility, originator incompatibility and interchange compatibility. They can be summed to give total compatibility.

Reciprocal Compatibility

Reciprocal Compatibility is measured by comparing how a person wants to be acted towards by another person with how he/she is actually acted towards. This type of compatibility exists if working with someone else results in a feeling of, "I can act the way I want" or "they give what I want'. It is measured as the sum of the differences between one person's expressed score and the other person's wanted score as shown in Formula 1.

Formula 1: Reciprocal Compatibility

Reciprocal Compatibility (RC) = (Ei diff. Wj) + (Ej diff. Wi)
(where E = expressed score, W = wanted score; i,j = two persons)

Originator Compatibility

Originator compatibility measures the "mix" of "originators" (high expressed score minus wanted score) and "receivers" (high wanted score minus expressed score). One originator would be expected to be highly compatible with one receiver. A high "competitive originator incompatibility" would be expected between two originators. A high "apathetic originator incompatibility" would be expected between two receivers. It is measured by summing the difference between the expressed and wanted scores for each person.

Formula 2: Originator Compatibility

Originator Compatibility (OC) = (Ei - Wi) + (Ej - Wj)

A score of zero indicates compatibility, a positive score indicates competitive incompatibility and a negative score indicates apathetic compatibility.

Interchange Compatibility

Interchange compatibility is a measure of the similarity of group members. A high inclusion interchange compatibility results in a high level of contact and interaction in the group. Control interchange compatibility is reflected by the amount of giving and taking of orders or advice. A affection interchange compatibility is reflected by the group members' closeness, intimacy, and emotional involvement with one another. Interchange compatibility is measured by taking the difference between the sum of the expressed and wanted scores of one person, and, the sum of the expressed and wanted scores of another person. The smaller the result the greater the compatibility.

Formula 3: Interchange Compatibility

Interchange Compatibility (IC) = (Ei + Wi) diff. (Ej + Wj)

Schutz suggests that compatibilities can be added to give a total in any dimension This is shown in Table 3.2. He comments that some compatibilities might be weighted to alter the total. However, how these weights are determined is not clear.

Table 3.2: Types of Compatibility

	Inclusion	Control	Affection	Total
Reciprocal Comp.	RCi	RCc	RCa	RC
Originator Comp.	OCi	OCc	OCa	OC
Interchange Comp	ICi	ICc	ICa	IC
Total	Ci	Cc	Ca	C

These discussions on compatibility implicitly assume a dyad. However, Schutz constantly refers to groups. It is not clear how group compatibilities should be calculated although Schutz suggests in a footnote that the variance should be used. With small groups this may not be appropriate. This issue is discussed again under data analysis.

Schutz's approach to the study of groups is typical of much psychology research. In an attempt to be objective, the group's end performance is measured. This contrasts with the more 'interpretive ' approach of studying the attitudes of a group as it works on a task [Burrell and Morgan, 1979]. Using the output measurement approach with a collaborative task, it is not possible to determine whether one person did all the work for the group. From the interpersonal theory viewpoint, this is not relevant. Either the group is compatible or it is not. If one person does all the work and there is no conflict then the group is compatible. In this situation,

Schutz's theory suggests that the group would be compatible either on inclusion needs or control needs. In terms of inclusion, all members of the group are expected to have low expressed and wanted inclusion. The group will then have a high originator compatibility. In terms of control, the person doing the work would be expected to have a high expressed control score while the other members are expected to have high wanted control scores. The group would then have a high reciprocal compatibility.

Schutz's Postulate 3 asserts that compatibility results in goal achievement. This causal relationship assumes a number of things. First, it is assumed that the group accepts (internalises) the goal, and that it becomes *their* goal rather than something which is imposed on the group from the outside. If a group does not accept an imposed goal then high compatibility will assist in rejection of the goal. Performance measurements may, be misleading depending on whether externally set goals were internalised. Schutz suggests that this problem can be accommodated by including the goal setter's interpersonal orientation scores as part of the group. Second, it is assumed that compatibility or satisfaction alone leads to performance. It is generally accepted, however, that satisfaction plus some external motivator result in high productivity. Third, it is assumed that there is a link between effectiveness and efficiency. This assumes that there is goal congruence and that the group has the ability to perform the task [Emmanuel and Otley,1988,p.53]. If a group's compatibility is used as a measure of its productivity, then these other intervening variables must be considered.

Becker and Green [1962] asserted, but did not test, that high cohesion budgeting groups would perform better than low cohesion groups. Schutz established a link between compatibility and group cohesion. His theorem 3.3 states, "If the compatibility of one group, h, is greater than the compatibility of another group, m, then h will be more cohesive than m". Schutz tested his theorem by calculating the rank order correlation between the different types of compatibility and Gross's [1957] nine criteria for cohesion. However, he found that only the correlation between total

compatibility and cohesiveness was significant (0.81 at 5%).

Gross [1957] has been criticised for not clearly defining cohesion [Goodman et al.1986; Shaw,1983]. For example, Goodman et al.[1986] make the distinction between group cohesion and task cohesion. Group cohesion is affection cohesion of the members of the group: "attractiveness of the group for its members, or forces to remain in the group' [Cartwright,1968]. This cohesion is probably associated with attraction compatibility [Shaw,1983]. *Task* cohesion is a cohesion to the task not the group. The member wants to achieve the task and may be merely using the group to achieve the task.

If cohesion is related to compatibility then the relationship between cohesion and performance is of relevance to the compatibility debate. The relationship between cohesion and performance is unclear. Goodman et al.[1987] comments, "The research literature indicates that cohesiveness will affect the variance of production, and the direction of the effect may be positive or negative". He argues that the attraction aspects of cohesion may be more a measure of the desire to participate, than to achieve some goal. The link between cohesion and productivity has been asserted rather than empirically established. The empirical evidence is inconclusive. Stogdill [1972] surveyed thirty four studies on cohesion and performance and found that, twelve reported a positive relationship, eleven reported a negative relationship and eleven reported no relationship. The introduction of moderating variables such as "company support" [Seashore,1954] and "drive" [Stogdill,1972] had little effect on these results.

Cohesion is assumed to work by members accepting, in an unspecified way, group norms in return for the advantages of being in the group. Goodman [1987] argues that there is no reason to assume, or evidence to show, that visible group norms exist. If they do exist then there are questions of if and when the group changes its norms. Norms are discussed in more detail later. It was to clarify some of these problems, that

Goodman suggested a separation of task and attraction cohesion. More precisely, he suggests that cohesion should be defined as the commitment of members to the group task. This he calls task cohesion. Commitment is thus interpreted as the binding of an individual to behavioural acts. Commitment can be increased by making the task explicit, public, irrevocable and voluntary. The task is the set of activities which the group must perform in order to achieve the group's goal. With this definition, a member can be committed to the group task but not necessarily to the group. It is an empirical question whether high commitment groups are more productive. However, it would be anticipated that high commitment (task cohesion) groups would react, to negative feedback. Whether this was a positive or negative reaction would depend on whether they had internalised the task. Goodman's definitions, therefore, serve to separate the interpersonal and cohesion theories.

Task Interaction.

The impact of interpersonal behaviour on performance appears to be contingent upon task type. Tasks requiring high levels of interchange[2] are probably more dependent on interpersonal behaviour than others. This view is supported by Goodman who suggested [1987] that groups should be classified by the interdependence of their task. Tziner classified tasks as either collaborative or co-operative. This classification scheme is consistent with the view that the impact of interpersonal behaviour on performance is dependent upon task type. Schutz formalised this view as his theorem 3.9 [p.159] that: "the effect of compatibility on productivity increases as the task situation requires more interchange in the three need areas'. He demonstrated this relationship with research which showed increasing correlations for three tasks requiring increasing interchange.

Budgeting is a task for which different degrees of interaction are possible. While there is little evidence that group forecasting is superior to individual forecasting,

2. Requiring communication between group members.

much of the accounting literature emphasises the benefits of group effort when budgeting task. It is usually argued that a budget produced by one person has not taken advantage of the benefits from group work [Sage,1981]. For example, participation may assist with obtaining committment for the implementation of the budget and may improve inter-departmental communications [Brownell,1982]. In spite of this conventional wisdom, it is possible for budgets to be prepared by a group using a wide range of interaction. In some cases, it may be prepared by an individual with other members of the budget group contributing nothing. In other cases a sub-group may do the work. In other cases there may be full participation by all members of the group. Schutz's interpersonal theory suggests that the members will have differing needs for interaction. On the one hand, therefore, there is a task which appears capable of accomplishment by a group using a range of levels of interaction. On the other hand, there are group members with a range of needs for interaction. It would appear that in budgeting compatibility can be achieved simply by adjusting the level of interaction in the group to that required by the personal needs of the members. This requires that the group is compatible in some form and that the final budget is acceptable to all the members. It also requires that there are no external forces acting on the budget group, trying to encourage a high level of interaction in the belief that this will increase, say, commitment to the budget.

Research Using FIRO

Shalinsky [1969] suggested that there must be time for the group to establish interpersonal compatibility. Schutz believes that his three variables, inclusion, control and affection take different times to affect behaviour. He suggests that as the group forms, inclusion compatibility issues will affect performance. As the group starts to work together, control needs will alter the behaviour of members. Finally, when the group has worked together for some time, affection needs will begin to alter behaviour. Armstrong [1985] studied the empirical evidence of the relationship between participation and forecast accuracy. He concluded that it takes time for

effective participation. In designing or analysing compatibility experiments it is, therefore, important to consider the time which is allowed for interpersonal behaviours to influence performance.

The FIRO-B research in this area has been summarised by Shaw [1983] and Whetten and Cameron [1984,p.60]. They both conclude that most of the literature supports that group compatibility is associated with higher performance.

> "Research confirms this prediction. For example DiMarco (1974) found teacher attitudes are more favorable towards students when compatibility scores are high. Obradovic (1962) has found that low incompatibility scores result in more favorable attitudes of subordinates towards managers. Hutcherson (1963) has found that students achieve higher levels in classes when compatibility with the teacher is high. Friends have also been found to be chosen more often from among those with compatible scores. Sapolsky (1965) and Mendelsohn and Rankin (1969) have even found that the sucess of therapist-patient treatment is affected by interpersonal compatibility" [Whetten and Cameron,1984].

Whetten continues later:

> "There is strong evidence that groups composed of compatible individuals are more satisfying to members and more effective than groups composed of incompatible individuals. The following are some characteristics that studies (Hewett, O'Brien, & Hornik, 1974; Liddell & Slocum, 1976; Reddy & Brynes, 1972; Shalinsky, 1969; Schutz, 1958; Smith & Haythorn, 1973) have found typical of interpersonal compatible groups:
> 1. More interpersonal attraction among members,
> 2. More positive group climate,
> 3. More cooperative behavior on tasks,
> 4. More productivity in accomplishing tasks,
> 5. Faster problem solving,
> 6. Fewer errors in solving problems.
> 7. Less hostility among members"
>
> [Whetten and Cameron, 1984].

These findings are qualified by the studies of Hill [1975] and Hoffman & Maier [1961]. They tested for a non-linear relationship between compatibility and performance and found that groups with a small amount of incompatibility outperformed perfectly compatible groups and strongly incompatible groups. Bouchard [1969] found the same relationship in groups which were formed for idea creation.

In many of these studies members were allocated to compatible or in-compatible groups using their on the interpersonal skills instrument. These managed membership groups

were then given task. In a field test, this type of arrangement may not be practical because of the risk of groups breaking up. In addition, self-selection of groups provides a test of whether incompatible groups form naturally. If self-selection results only in compatible groups, then the relevance of compatibility as a variable in budgeting research is doubtful.

Many studies are unclear about how group compatibility was determined. Schutz's equations dealt only with dyads. However, incompatibility in larger groups may depend upon compatibility mix and the role of intermediaries. For example, with groups of four members, an intermediary may moderate extreme incompatibilities that may exist between any other two members in the group. Self-selection allows a study of naturally formed groups. This issue will be considered later.

Conclusion

Schutz presented a detailed theory of compatibility which has been supported by empirical evidence. These results may have only limited application to budgeting because of the nature of the task and the presence of self-selecting groups. The budgeting literature has acknowledged the importance of cohesion on performance. There is probably some association between compatibility and group cohesion. As compatibility is better understood than cohesion, it may be beneficial to use it in budgeting research rather than cohesion.

[B] COGNITIVE COMPATIBILITY

Cognitive Style

This section defines cognitive style, with particular emphasis on information processing style. It also considers the evidence that incompatibility results from different cognitive styles in a group and Keen's [1973] suggestions for reducing this incompatibility. It is argued that information processing cognitive style is a variable which should be considered in a study of group performance because it has interpersonal ramifications.

Schutz's approach to interpersonal orientation gives little consideration to cognitive style. This is probably because the two topics developed separately. Green [1985] identified the origins of cognitive style research in personality and intelligence testing. It was found that these two variables were unable to explain differences in performance. Green argues that cognitive style is similar to intellectual capabilities, but that abilities and attitudes depend upon those specific skills which are necessary for proficient job performance. She concludes that cognitive style is concerned with typical spontaneous behaviour and that it is bi-polar. It is, therefore, contingent rather than "more-is-better" and has more to do with controls on mental functioning than on an ability to handle specific situations. She cites the empirical evidence of Federico and Landis [1980] to support her argument. They wrote: "that while cognitive style is correlated with ability/aptitude, the magnitude of the correlation is low, suggesting that measures of cognitive style provide complementary, nonredundant information".

"Cognitive style refers to the process behavior that individuals exhibit in the formulation or acquisition, analysis, and interpretation of information or data of presumed value for decision making" [Sage, 1981]. Whetten and Cameron [1984,p.46] extend this definition to include the perception, interpretation and response to

information. "The cognitive style paradigm emphasizes the problem solving process rather than the cognitive structure or capacity. It categorizes individual habits and strategies at a fairly broad level and essentially views problem solving behavior as a personal variable" [Keen and Morton,1978]. Some writers [e.g.Mischel,1979] suggest that there is a difference between cognitive styles and personal characteristics. Huber [1983] comments that: "cognitive style emphasizes an approach rather than an ability".

Whetten and Cameron [1984] consider the stability of cognitive styles:

> "The basic premise is that every individual is faced with an overwhelming amount of information, and only part can be given attention and acted upon. Individuals therefore develop strategies for dealing with the information they receive. These are neither inherently good nor inherently bad, and not every one adopts an identifiable set of strategies that become part of their cognitive style. However, most individuals do develop, mostly unconsciously, a preferred set over time, and these make up their unique cognitive style"[3].

Whetten's use of the term "preferred style" suggests that cognitive styles are therefore subject to "anchoring" [Hogarth,1980] and use in many different circumstances. Mischel [1979] supports this argument by suggesting that the nature of the task is the main determinant of the preferred cognitive style. Thus, if a person repeatedly performs one type of task then he/she may develop a strength, a preference or a first approach style, which will then be used regardless of the situation. Goldstein and Blackman [1981] and Messick et al. [1976] also argue that cognitive style is stable, that is, not easily altered. Their evidence includes Kagan and Kogan's [1970] and Kirton and McCarthy's [1988] failure to alter cognitive style by training. Their work, however, does not deny that people may be capable of alternative approaches given enough stress.

Differing cognitive styles suggest a contingency theory of information processing. Belief in the presence of different styles led Drakes [1973] to modify the well known "garbage in, garbage out" expression to "one person's garbage is another person's bread and butter'. Ackoff's [1967] comment could be extended to, "do not produce more

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3. Information overload is a problem with budgeting [Iselin,1988].

information but the right type of information for the style of the user". Much of the management literature on information processing cognitive styles is concerned with designing computerised information systems which are suitable for particular users [Zmund,1979; Mason and Mintroff,1973; Gul,1984; Chenhall,1986; Huber,1983]. However, Huber [1983] believes that much of this research is ill conceived. He argues that the impact of cognitive styles on performance is weak at best and that there are more important criteria which should determine the design of a management information system (MIS). He also questions whether individual differences can be accommodated in a system that will be used by a group. If the system was designed to the style of the average user then "...it would be inapplicable to any one decision maker..." [p.570]. Taggart [1981] suggests that the problem can be overcome by having management with adaptive processing styles. "Managers should be flexible in processing style...they are more effective if they can change their style to fit their problems". Despite the evidence on the difficulty of using training to change cognitive styles, [e.g. Kirton and McCarthy,1984] Huber suggests more research on training methods to assist managers to adopt multiple information handling strategies. If alternative training methods are ineffective then Taggart's suggestion will only be preferable if some people are born with a range of styles. The distribution of styles found by Myers [1980] and Keen [1973] suggests that most people do not have an extreme style. This may indicate that some managers do have flexible styles. It also suggests some tolerance for different styles within a group. This possibility is relevant for this research.

Huber's concern with research into individual performance, given certain cognitive styles, is reflected in this study. Budgeting requires managers with similar status to work in small groups without time constraints. This study is concerned with how the individual cognitive style of managers affects the group's performance. What are the interpersonal consequences of different cognitive styles?

Much of the research into information processing styles has been undertaken by

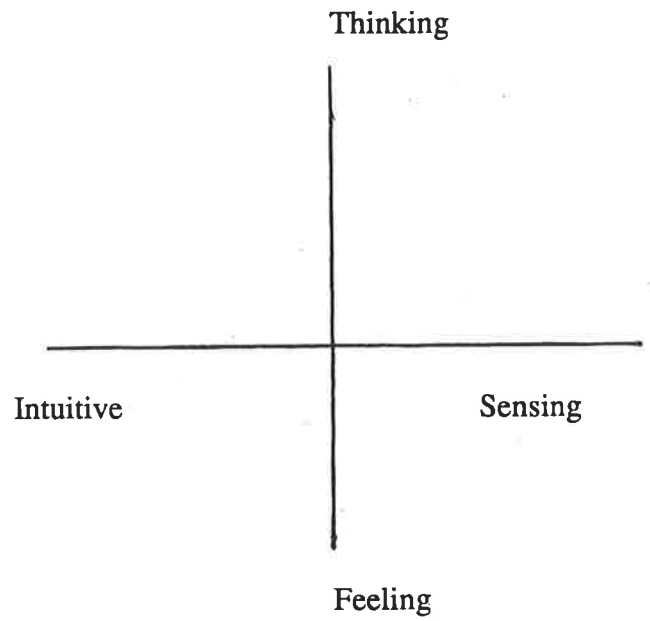
psychologists. This research has usually involved small tasks, has covered a wide range of unrelated problems and has been more concerned with member satisfaction than group performance. For example, Gruenfeld and Lin [1984] considered the effect of "field dependence" on group "comfort". They concluded that it had a negative effect. Varca and Levy [1984] used individual differences in a particular cognitive style called "repression-sensitization" to see how they affected group reaction to negative feedback. In contrast the studies reported in the accounting literature [e.g.Gul,1984; Chenhall,1986; Iselin,1988] have been more concerned with individual performance in management groups and tasks. They have typically used perceived performance which may be associated with self-confidence and/or ability. It is possible that some cognitive styles are associated more with self-confidence than others. There is a possibility that ability and style are not independent for some tasks. There is, therefore, a need for budgeting research which focuses on group performance measured in an objective manner.

Eckstrom et al. [1979] identified thirty-two different cognitive factors. They ranged from "need for gestalt closure" to "styles for searching data". However, the cognitive activities most relevant to this study are information processing styles. Sage [1981] outlined four popular models of information processing cognitive styles and commented on their similarity. Bariff and Lusk [1977] used cognitive complexity, field dependence and the systematic/heuristic scale in their work. Cognitive complexity is divided into differentiation, discrimination, and integration. Differentiation is the number of dimensions which are perceived in some data. Discrimination is the "fineness" with which data is assigned to categories. Integration is the detail of interconnections among rules for combining data. Field dependence is a measure of how easily individuals can separate a problem from its environment. The systematic/heuristic scale refers to how individuals search information. They may do it systematically or heuristically. The cognitive style model developed by Driver and Mock [1975] used a heuristic/analytic scale. A heuristic person is likely to use intuition, past expe rience and insight while an

analytical person is more likely to use a logical or methodical approach. Driver and Mock classify decision makers by their degree of focus on the use of information and the amount of information which they seek.

Myers [1980] used a cruciform based upon Jung's work as the basis of their cognitive model. It is illustrated in Figure 3.3

Figure 3.3: Myers and Briggs Cruciform



In one plane they put information acquisition, with extremes of "intuitive" and "sensing" persons. In the other plane they put information evaluation, with extremes represented by thinking and feeling persons. This instrument has been widely used in the psychological and management literature. It classifies persons into four types. "Sensing-Feelers" are technique orientated reductionists who are concerned with the details and facts of human relations. "Sensing-Thinkers" are technique orientated reductionist who are concerned with work rules and roles. "Intuitive-Thinkers" are holistic speculators who are concerned with impersonal problems. "Intuitive-Feelers" are holistic speculators who are concerned with people and relationships.

Keen [1973] also derived a model of cognitive style which used information acquisition but he divided it into "receptive" and "preceptive" components. He divided the information evaluation, scale into "systematic" and "intuitive"parts. His instrument was designed using twelve paper and pencil tests. His two dimensions have been extended by Whetten and Cameron [1984] to include "response to information". The attraction of Keen's instrument is that it was designed for the problem of M.I.S. team compatibility. It has more than one dimension, it is strongly grounded in psychological theory (especially the work of Bruner on concept formation and Piaget on cognitive development) and it has been used in research into problem solving behaviour. Johnson and White [1982] have retested Keen's instrument and confirmed the results.

As mentioned, Keen's information gathering style has a scale running from receptive to preceptive. "Receptive thinkers tend to...suspend judgement and avoid preconception. ...be attentive to detail and to the exact attributes of data. ...insist on a complete examination of a data set before deriving conclusions. Preceptive thinkers tend to...look for cues in a data set. ...focus on relationships. ...jump from one section of a data set to another, building a set of explanatory precepts." The second dimension is information evaluation and has a scale running from systematic to intuitive. "Systematic thinkers tend to...look for a method and make a plan for solving a problem. ...be very conscious of their approach. ...defend the quality of a solution largely in terms of the method. ...conduct an ordered search for additional information. Intuitive thinkers tend to...keep the overall problem continuously in mind. ...redefine the problem frequently as they proceed. ...jump from one step in analysis or search to another and back again. ...explore and abandon alternatives very quickly." [McKenney and Keen, 1974]. The third dimension is the response to information and uses a scale ranging from reflective to active. "Individuals employing a reflective strategy are inclined to ponder information for a longer time before taking action. They tend to observe rather than participate, and the practical application of information is not nearly so important to them as its

meaning and conceptual logic. They are thinkers not doers. Individuals employing an active strategy are inclined to experiment with an idea or to execute a behavior as a result of receiving information. They are doers rather than thinkers, and they are more interested in practical application than in theoretical elegance. Actives feel impatient if a solution or action is not forthcomimg when confronted with a problem". [Whetten and Cameron,1984].

Keen [1973] compared his instrument with that of Myers and Briggs and he concluded that both measure a preference, that their definitions of "intuitive" are not the same, and that the Myers and Briggs' instrument measures personality while his is concerned only with information processing styles. Keen correlated the Myers and Briggs' four quadrants with his systematic - intuitive scale and found few significant results. Neverthless, he suspected that there was a relationship between personality and cognitive style. Keen also correlated ten cognitive ability tests with the four Myers and Briggs' quadrants and concluded that there is "no clear relationship between psychological type and cognitive ability".

Cognitive Compatibility

Group members with different cognitive styles may experience incompatibilities which could affect the group's performance. Incompatibility which is due to differences in cognitive style is called cognitive incompatibility [Keen,1973].

If members of a group have different information processing styles then they may waste time on their incompatibilities in a manner similar to that mentioned with inter-personal compatibility. Whether the degree of incompatibility can be sufficient to affect performance is an empirical question. In-compatibility cannot be avoided simply by not forming groups comprising members with different styles. Effective performance of a group task may require that group members have a range of styles. For maximum performance a group may need to have a wide range of information

processing styles provided that the group is reasonably compatible.

There is some empirical evidence of cognitive incompatibility between information processing cognitive styles. This suggest that the incompatibilities can be strong enough to affect performance. Much of this research has considered the impact of cognitive compatibility on the performance of groups developing management information systems. The designers in the group usually do not have the same cognitive styles as the system users. The different styles has led to ill feeling in the group. For example, White [1984] studied the feelings of users in two MIS projects. In one project, none of the system designers were found to be "intuitives". The system users were not satisfied with the designers who they described as "technicians". In the other project, the designers had a wide range range of styles and the users perceived them as friendly and competent. The users were mainly intuitives. These type of finding suggest that if the designers and the users are perceived as a single group then group cognitive compatibility is relevant to performance.

Kirton and McCarthy [1988] used the term "cognitive climate" in their review of the literature on cognitive compatibility in work groups. The cognitive climate is determined by the dominant cognitive style of a group. They conclude that if people of one style work in a group in which another style dominates, there will probably be incompatibility. Hayward and Everett [1983] studied employees in local government and found that: "the resignation pattern at the end of their study (a period of nearly three years) was disproportionately those staff that had a innovative" style when the cognitive climate was for the "adaptive" style". They used Kirton's Adaptors/Innovators scale and demonstrated that the incompatibility was strong enough to be reflected in staff turnover figures. Thomson [1985] argued that those in a compatible cognitive climate would be reluctant to indicate an intention to leave a group. She studied Singaporean managers working in multinational western companies, and found that the intention to stay was associated with a feeling that other people in the work group approached problems in the same way.

In an alternative approach to cognitive compatibility Wegner et al. [1985] reintroduced the concept of the "group mind", which they described as transactive memory. They suggested that a group "memory" had two components. They are (i)an organised store of knowledge that is contained entirely in the individual memories of the group members, and (ii)a set of knowledge-relevant transactive processes that exists among group members. If retrieval processes can use the memory traces and cues of two people then there is the question of whether group members can be incompatible and/or specialise in a cognitive style. Wegner et al. cite their own research into "dyad compromising" which found that close dyads seeking a consenus would alter their original suggestions to a third solution. For example, if the two had independently suggested a good bed time as 12:00am and 1:00am, their dyad decision might be 1:30am. For dyads that were not close, one person would dominate or they would agree on a compromised average. "For 'close' couples, therefore, initial discrepancies resulted in increased attempts to unite the pair with unique, group-generated solutions" [Wegner et al.,1985]. Elsewhere they comment that: "one partner may bring one set of knowledge, the other may bring something different, and they then may experience some conflict. But in a healthy dyadic relationship, this conflict does not necessarily lead to the dissolution of the group. Rather, it energizes the integration process, leading the couple to seek some new conceptualization that will transform their conflict into agreement". This suggests that compatible (in the sense of having an integrated structure in transactive memory) groups will be more productive.

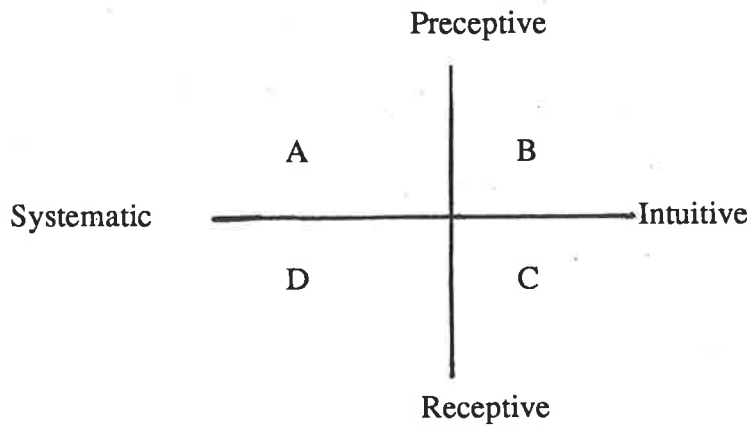
Witkin and Goodenough [1977] found that in student-teacher contacts, individuals recognise very quickly if they have the same cognitive style. If they do then they will be much more likely to develop a good relationship.

Grayson [1973] also questioned whether people with extreme cognitive styles are tolerant of each other. He suggested that systematics see intuitives as inconsistent and intuitives see systematics as pedestrian. He believes the differences may be

strong enough to stop the formation of friendships or working relationships.

Keen [1973] used his own instrument to argue that styles from opposite quadrants will be incompatible. His instrument uses a cruciform which identifies four types of cognitive style (see Figure 3.4). These extremes are Systematic/Intuitive on the horizontal axis and Preceptive/ Receptive on the vertical axis. He argues that a person of, say, the style represented by someone with a score represented by quadrant A in table 3.4 will be incompatible with a person who's scores put them in quadrant B, as will D and B.

Figure 3.4: Keen's Cruciform



The incompatibility of people who's score places them in quadrants D and B may be demonstrated by considering two well known fictional characters. Sherlock Holmes would be a Systematic/Receptive, as befits a devotee of Victorian scientific methods. Dirk Gently, on the other hand, as a representative of modern 'alternative' science with an interest in interconnectiveness and holistic solutions, would be an Intuitive/Preceptive. The two could assist each other in solving a problem but their different information processing styles would probably cause conflict.

Intermediaries

The research to date does suggest that cognitive incompatibility exists. It would, therefore, be useful if some way could be found of enabling incompatible persons to work together in a group. Keen suggests the use of 'intermediaries'. First, he argues (using the representations in the figure above) that A and B; B and C; C and D; and D and A will be compatible in one dimension. Any of these dyads should, therefore, be compatible enough to enable them to work usefully together. However, groups made up from only two of the four possible quadrants may lack the range of styles necessary to complete a management task. Keen's solution to this problem uses the mechanism of an intermediary for triad compatibility. If A,B and C styles made up a team, he argues that B would mediate to reduce the conflict between A and C. The result would be a range of styles and compatibility.

However, Keen implicitly assumes the presence of dominant styles. The scores from Keen's instrument result in an interval scale of styles in the two dimensions. Keen suggests that those with non dominant styles may be "switchers" or "random fluctuators". The former are people who adjust their cognitive style to suit the problem, and the latter are people who have not developed their cognitive strategies into a cohesive approach for solving perceptual and intellectual problems. Keen also argues that those without a strong style may act as mediators between those with strong styles.

Conclusion

While the construct of cognitive style may yet to be clearly distinguished from personality or ability, there is some empirical evidence that cognitive in-compatibility can be measured. Also, as it is not clear whether this incompatibility was factored into Schutz's FIRO-B instrument it was thought appropriate to include a test of the impact of cognitive style and of cognitive incompatibility in any study of

group performance. However, the presence of intermediaries may considerably moderate this impact, making measurement difficult.

[C] ABILITY

Abilities

It is generally agreed that the performance of a group is a positive function of the ability of its members [Yetton and Bottger,1983]. However, the issue is not simple. There must be an appropriate measure of ability. In addition, there are many variables which may influence the relationship between ability and performance. This section considers these issues and concludes that ability should be considered in research on group performance.

Ability has been widely studied [e.g.Cattell,1971]. Initially it was believed that ability could be divided into a 'general' ability and 'task specific' ability. However, later studies found other dimensions. Cattell [1971] suggests a list of types of ability which includes verbal, numerical, spatial, perceptual speed, speed of closure, reasoning, memory, word fluency and a mechanical skill abilities. It has also been found that ability is strongly related to personality and to motivation which are related to each other. In the management literature Vroom [1964] has suggested that performance is a function of ability multiplied by motivation. If ability is dependent on motivation then Vroom's relationship must be doubtful. Tziner and Eden [1985] and Campbell and Pritchard [1976] found no support for Vroom's suggestion. Cattell [1971] concluded that ability is largely the result of long term motivations.

Other Variables

Schutz [1966] considered the relationship between ability and interpersonal behaviour. He believed that a person with a strong desire to dominate others would be motivated to perform well in all tests of comparison. The relationship between ability and power is also demonstrated by the manner in which most measures of ability are

presented as rankings, giving power (authority) to those who head the list. Also, ability measures are extensively used to rationalise the allocation of power positions. Schutz suggestion that ability would be positively correlated with high control needs, therefore, appears congruent with everyaday observations of the use of ability scores.

While motivation and ability seem to be related there are other variables which may confuse the relationship between ability and performance. These variables include group size [Goldman,1971], aggregation (ability mix) [Tziner,1986] and task [Tziner and Eden,1985]. Goldman [1971] found that for a learning task, an increase in group size was of greater benefit to a low ability group than to a high ability group. Egerbladh [1976] found that high ability groups gained more from working in small groups than low ability groups. Yetton and Bottger [1983] found that the high ability groups were less vulnerable to changes in size or task. They also also found that ability was more important than group size in determining performance. While the results are not always consistent they suggest a relationship between group size and ability. Research about ability and performance should, therefore, either control or correct for group size.

Task Type

Task type also influenced the relationship between ability and performance [Tziner,1986]. The tasks used in ability research are varied, but with the exception of the work of Tziner, they are rather simple. The tasks that have been used include the NASA moon exercise (a cognitive task) [Yetton and Bottger,1983], operating army tanks [Tziner,1986] and IQ tests. Tasks can be classified by whether they are manual or cognitive and by the level of group members' knowledge. Management research probably requires tasks which rely on part of the knowledge of the members be general, and part to be the specific knowledge of individual members. Tasks can also be classified into those which are collaborative or those which are co-operative. A

collaborative task requires all the members to work on one exercise at the same time. It is a joint effort. A co-operative task requires that each member performs a subtask to achieve an overall objective (e.g. as in Tziner's Army tanks). Because of the ease of devising collaborative tasks in experimental situations there has been more research on this type of task than an co-operative tasks. As the management literature has been primarily concerned with controlling direct labour, manual tasks have been used more frequently than cognitive tasks. In budgeting, a cognitive co-operative and collaborative task is involved. The more managers specialise, the more co-operative the task will become.

Aggregation also influences the relationship between ability and performance [Tziner,1986]. Tziner argued that the mix of ability levels within a group will affect performance. He says;

> "Hill (1982), Shaw (1976), and Steiner (1972) conclude that members' task-relevant abilities simply combine in an additive manner. In their view, each member contributes to group production in a direct proportion to his or her task relevant ability, irrespective of other members' task-relevant abilities. The higher a given member's task-relevant ability, the better the group's performance. Yet some research results indicate that group performance often differs from this simple additivity (Rohrbaugh,1981), both for better and for worse. On the one hand, there are reports of positive nonadditivity, when groups seem to accomplish more than the sum of their parts (Egerbladh,1976). On the other, there are cases of negative nonadditivity in which efficacy falls below that predicted from individual task-relevant skills and talents. These have been excellently discussed by Hackman and Morris (1983) under the rubric of 'process loss'. These deviations from additivity have attracted some ad hoc theoretical explication. Laughlin and Johnson (1966), for example, link positive nonadditivity to the combination of unique resources, each necessary for a separate task facet. Alternatively, Secord and Backman (1974) have argued that negative nonadditivity, or the inhibition of group production, is due to the feelings of anger evoked by pairing with inferior partners."[Tziner, 1986].

Tziner also suggests a need for a theory on aggregations. He proposes the use of Equity and Similarity theory.

Yetton and Bottger [1983] had a different approach to aggregation. They found evidence for a 'best-member' strategy and concluded that a group's performance is largely determined by the performance of the best member. The other members in the

group serve to enhance the performance of the best member. Their ability determines their degree of influence on the best member.

Conclusion

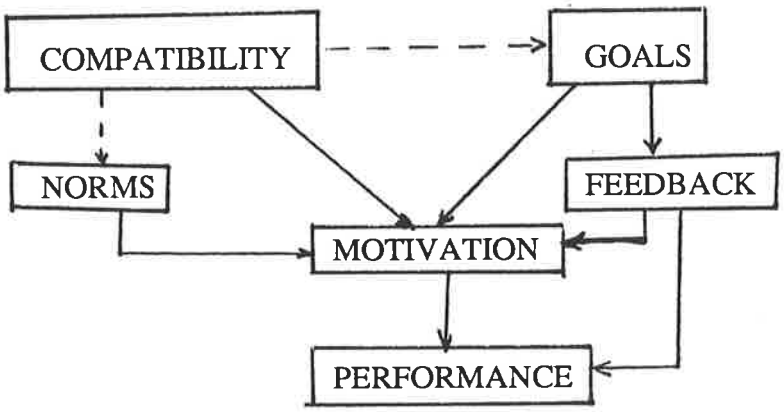
The measure of ability which is used is an important component in ability research. In budgeting research a simple measure such as an IQ test is probably inadequate as the task requires specific skills and knowledge such as costing techniques. An obvious and non-obtrusive measure for this research is cost accounting coursework grades. They provide an individual measure of the appropriate skills mix which includes the list of types of abilities listed above (memory, numerical, specific knowledge etc.). The motivation levels should also be similar. The examinations and the task were awarded grades towards the degree. A student motivation level towards the entire course could be expected to change little for specific facets of that course.

CHAPTER 4: THE MOTIVATION MECHANISM

Introduction

It is not obvious how group compatibility influences the group's performance. This section reviews the literature dealing with the relationship between compatibility and (i) norms, (ii)motivation theories and (iii)goals. There is a complex inter-relationship between goals, motivation and compatibility. For example most theories of motivation have an interpersonal dimension. A link between compatibility and motivation may indicate a relationship between compatibility and performance.

Figure 4.1 Motivation Variables



NORMS

The association between group norms and performance will be considered. The suggestion that a compatibility affects performance by ensuring 'loyalty' to the group's norms is questioned. Even if this assumption were found to be correct it still does not explain any association between compatibility and performance.

Schutz [1966] argued that compatibility leads to cohesion. Goodman [1987] observed that it is widely believed that cohesion leads to group norms which provide the social control that allows the group to perform. For example, Milgram's [1974] research

suggested that social control (obedience) is very strong, once norms have been established. Goodman [1987] reported that: 'norms and cohesiveness are the two central social-psychological concepts in a model of group effectiveness. Cohesiveness captures the energy and effort members will allocate to the group task and norms identify the ways to channel that effort'. Steers [1981] wrote that, 'Norms are a standard that is shared by group members and which regulates members' behavior'. It appears, therefore, that norms form to deal with the interaction processes in a group. They must be a compromise between the independence needs of individual group members and their needs for group help.

McGrath [1984] suggested that norms provide group members with a frame of reference for understanding the task and for uniformity of action. They eliminate the need to use personal power and they make the group more efficient (output/input). However, surely certain goals may be more effectively achieved achieved without some norms and norms cannot be expected to be present for every aspect of a group's activity. How norms are converted into an increased effectiveness (achieving goals) is not made explicit. If they do lead to effectiveness then there must be a direct link between efficiency and effectiveness. The existence of such a link is not obvious but it may work because less time is spent on co-ordinating activities more will be spent on task output.

Hare [1976] believes that there are implicit norms. He cites the studies of Asch [1965] who used lines on a chart and the autokinetic effects of moving points of light. Hare [1976] suggested that a conflict of interests may make norms explicit. He suggests, for example, that if one member takes what the majority or dominant members of the group consider to be too long over a coffee break, then the anger expressed by the majority will 'correct' the deviant member's behaviour. He lists the possible responses available to a deviant member. The choice of appropriate response will depend upon an assessment of the 'cost of deviation' [Homans,1950]. The alternatives include conforming to the norm and reaping the group's rewards (intrinsic

and extrinsic), attempting to change the norm, or leaving. These alternatives suggests that norms are dynamic rather than static. For example, if a few people left the group then the norm may change. If a charismatic member broke the norm it may also change. It also not clear how much effort would be required to change a norm.

Hare [1976] suggested that the presence and importance of norms depended on such things as task ambiguity and the personality of the members. He believes that high anxiety, low neuroticism, high field dependence, high authoritaranism and/or self confidence would be more likely to accept norms. Expectancy theory suggests that the expected rewards and their attractiveness would also influence whether norms were accepted. This suggests that norms are flexible and situational.

Goodman et al [1987] posed some important questions which required answering before group norms could be understood. One of these questions was how can the existence of a norm be established. What is the relevance of their distribution (acceptance) through the group? How they are transmitted? How they are enforced and how easily they can be changed? These questions are important for this study. For example, a forecasting group might have norms about communication but will it have static unmovable norms on performance or efficiency? The answer to these questions may depend on the nature of the task. With forecasting does each round of the annual forecast have the same norms? What does feedback do to norms? Unless questions are answered, an assumption that a group will 'automatically' establish norms of, say, acceptable forecast accuracy cannot be made.

Much research about the existence of group norms has used either laboratory experiments using trivial tasks [e.g. Asch,1965], or repetitive manual tasks [e.g. Homans,1950;Seashore,1954]. In these later experiments the groups were satisfying the demands of managers. Typically they were trading off a fair return for the wages received and a favourable reappraisal of their piece rates. These findings may not be applicable to the higher cognitive tasks involved in middle management. Further,

Goodman [1987] questions whether this research indicates if the formation of norms or whether it simply records an historical statistical fact. Goodman also questions the relevance of the cohesion of the groups in these studies. Members were often independently producing a clearly visible output which was on display to co-workers earning a similar wage rate. Typically they would have to perform to a standard that allowed the other members of their group to earn their wages. The controls were explicit, and allowed little room for expressing discontent with group members through decreased performance. He also asked how the researchers knew that norms existed as it was usually the researcher's opinion that was reported rather than the results of a survey of the group members' opinions.

These criticisms of the research on norms and the lack of agreement on their nature and influence suggest that they are an unacceptable explanation of management group performance. A more useful approach may be to look at goals and motivation as the mechanism that links compatibility and performance.

MOTIVATION

'Motivation is the process of initiating conscious and purposeful action. It is the key to initiating, driving, sustaining, and directing behavior' [Segel,1989]. This definition probably includes, 'being more effective in achieving a goal' [Shaw,1983]. In his summary of the compatibility research Shaw [1983] says that: 'compatible groups are more effective in achieving group goals'. Given Segal's definition of motivation, this suggests an association between compatibility and motivation. It is usually assumed that situational variables can alter the level of motivation. House [1971] suggests three classes of situational variables. They are path goal clarity, performance appraiser's behaviour, and the personal needs of the actors. Most of the theories on motivation concentrate on the third class and assume that the individual is working alone. However, House's expectancy theory takes an approach which is more relevant to group interaction. 'The subordinate views the superior's behavior as

legitimate only to the extent that he perceives it either as an immediate source of satisfaction or as instrumental to his future satisfaction. For example, subordinates with high needs for social approval find warm interpersonal superior behavior immediately satisfying and therefore legitimate. On the other hand, subordinates with high need achievement desire clarification of path goal relationships and goal oriented feedback from superiors. The perceived legitimacy of the superior's behavior is thus partly determined by the subordinate's characteristics'. [Rohen and Livingstone, 1975]. This suggests a clear, if implicit, connection between motivation and interpersonal compatibility.

A major difference between group and individual performance is the motivation received from peer interaction in the former. The classic theories of motivation constantly refer to these interpersonal aspects. For example, the 'need hierarchy' theories of motivation [Maslow,1943;Wahba and Bridwell,1976] suggest that most groups give priority to survival (lower level) needs over interpersonal (higher level) needs. The lower level needs stress individual variables but most of the higher level needs involve peer interaction. Examples of these higher level needs include social needs, self esteem and self actualization.

Many writers have criticised Maslow's theory [e.g.Korman,1977] and some aspects have not been empirically supported. In some cases interpersonal needs are so strong that they can take priority over survival needs. For example, there are cases of people dying for loved ones or for authority figures, that is, for interpersonal needs. Despite these criticisms, Maslow's theory is still useful as a classification of motivators into physical needs and interpersonal needs. Alderfer [1972] rearranged Maslow's five basic needs into three. They were existence, relatedness (interpersonal needs), and growth (self-confirmed esteem needs). Alderfer has also placed physical needs ahead of interpersonal needs. Whilst this ranking may be questioned, Alderfer still believes that interpersonal needs can motivate. The theories suggest, therefore, that group work influences motivation levels through satifying

interpersonal needs.

McClelland [1961;1962;1975] suggested that a need to achieve is a major motivator and that different people have different achievement needs. He also mentioned the needs for power and affiliation as important variables which influence management motivation. These two variables are similar to the authority and the affection/inclusion dimensions of Schutz's interpersonal instrument. Achievement needs may be correlated with expressed authority or the need for achievement may result from interpersonal needs. This is an empirical question. Empirical work has supported the achievement motivation theory. When the theory was extended [Atkinson,1977] to include expectations of success and the attractiveness of the task, it was found that laboratory experiments also supported the theory. Future research could test for a correlation between achievement needs and interpersonal orientations.

Although the construct 'satisfaction' may be difficult to define and measure, motivation during long term cognitive tasks is generally believed to be a function of satisfaction [Herzberg,1966]. Herzberg's motivation-hygiene theory considers the sources of satisfaction. He suggests that the presence of some items may cause dissatisfaction but decreasing them may not lead to positive satisfaction. Empirical work on the theory [Schwab, Devitt and Cummings, 1971] suggests that while satisfaction may lead to improved performance, dissatisfaction may not lead to unfavourable performance. Generally, being satisfied appears to have some link to interpersonal needs. For example, a person working in a compatible group or situation may feel satisfaction regardless of the situation or task. Shaw [1983] in his summary of the compatibility research says that: 'compatible groups' members are more satisfied than members of incompatible groups'. The connection between satisfaction and compatibility suggests another link between compatibility and motivation.

Equity theory [Adams,1963] is based upon the concept of relativity in interpersonal relations. It suggests that feelings of relative fairness may influence motivation.

Whilst the empirical evidence is consistent with the theory [Leventhal et al., 1969] it is often hard to determine exactly how people establish what is fair. The theory suggests that group members subjectively calculate an input/output ratio, and use it to compare their own efforts against their rewards. Cosier and Dalton suggest [1983] that there is a need to include trends, time lags and perceived prior inequalities to have an understanding of how equity affects motivation. However, the theory does suggest yet another dimension to the relationship between group work and motivation. It provides a clearer indication of how the group work influences motivation levels.

It has also been suggested that motivation is a function of the subjective perceptions of expectation that a specific action will lead to a particular result, and the satisfaction that will gained from that result [Lewin,1951; House,1971]. Rockness [1977] expanded this idea to include multiple outcomes. The Expectancy theory implicitly assumes a superior-junior dyad and suggests ways that a superior[1] might motivate a junior. It assumes that the superior is not included in the group's compatibility scores (e.g. with a diverse shareholding).

Vroom [1964] extended the Expectancy theory to include the anticipated feelings of satisfaction (valence) that will flow from an outcome. Galbraith and Cummings [1967] divided Vroom's satisfactions into intrinsic (within oneself) and extrinsic components (given by others, e.g. praise). These satisfactions have an interpersonal compatibility dimension. Personal satisfaction may result from satisfying basic interpersonal needs. Acts such as peer appreciation, reducing task uncertainty by establishing group satisfying norms and a general opportunity to co-ordinate values, all bring intrinsic satisfaction. Intrinsic and extrinsic satisfactions are not mutually exclusive. For example, extrinsic satisfactions may result from explicit acknowledgments by other group members of one member's performance in the group.

The theory also indicates the problems which amy be posed by a group which sets a

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1. A superior being defined as one who controls the allocation of resources.

forecast goal that it cannot achieve. The model predicts that a forecast goal perceived as un-achievable will demotivate the group compared to a target that the group feels is achievable. The goals literature introduces a moderating variable. It suggests that a highly motivated group faced with a difficult task will only be demotivated if it does not have the resources and/or is unable to formulate a strategy and sub goals to achieve the main goal. The expectancy model also suggests that effort must be rewarded so there is an expectation of reward for effort. This highlights the importance of feedback. This echoes Parkinson's [1957] wry comment that 'organisational stagnation occurs when the reaction for successful acts is the same as for unsuccessful acts, mainly none'. Expectancy theory, therefore, provides an explanation of how group work influences members' motivation levels.

Tziner and Eden [1985] question whether the motivational levels of a group member is influenced by the motivation levels of others in the group. Their study examined both ability and motivation levels. They concludd that:

> 'composition effects were found for ability but not for motivation. Motivation contributed only additively to crew performance, the impact of one person's motivation on crew performance being in no way dependent on the motivation of the others. Different members' levels of motivation do not interact as their abilities do. Thus, how people perform together is determined in part by their similarity in ability, but not at all by their similarity of motivation. This finding confirms a similar result already reported by Bouchard [1969] referring to collaborative tasks. Also conspicuously absent were any interactions between ability and motivation that could have been anticipated relying on the dictum that performance = Ability x Motivation, suggested by Vroom [1964]. It is possible that the Ability x Motivation interaction needs to be tested only with individual performance as the dependent variable and that the interaction gets somehow dissipated when individual efforts are combined into group output as in the present experiment. However, it is also possible that Vroom's longstanding dictum, though plausible, convincing, and widely quoted, is a poor explanation of actual behaviour. The measures employed in the present experiment were demonstrably reliable and valid and detected both main and interaction effects. Therefore, Ability x Motivation interactions would have been detected had there been any. This is in fact consistent with Campbell and Pritchard's conclusion [1976], following their review of the literature, that the attempts to account for additional variation in performance by some multiplicative combination of motivation and ability variables have been unsuccessful'.

As mentioned earlier, there are some doubts about the independence of ability and motivation. What is measured as ability may be motivation.

GOALS

Goodman [1987] has cast doubt on the belief that norms influence performance. Locke et al. [1981] suggest that goal theory provides a better explanation of the relationship between compatibility and performance. The two approaches are not mutually exclusive. Locke et al. [1981] define goals to include norms, although, goals are usually considered to be more explicit and have to be set. In addition, norms are usually discussed in the context of group social behaviour whereas goals are associated with directing activity.

Locke et al. [1981] define a goal as that which an individual is trying to accomplish, or as the object of an action. A goal is similar to a "purpose" or an "intent". They reviewed the research on goal setting and task performance and concluded that setting goals enhances performance and that there was little evidence that personal differences influence this result. Goals moderate the direction, the level and the duration of effort. They assert that this result is one of the most robust and replicable in the psychology literature. In a more recent survey of Canadian firms, Simons [1988] also found a correlation between tight budget goals and performance[2]. The provisos to these results is that the goal must be considered worthy of attempt and must be accepted by the actor. Locke et al., therefore, suggest that goals are a motivational device in their own right. "All-encompassing theories of motivation based on such concepts as instinct, drive, and conditioning have not succeeded in explaining human action. Such theories have been gradually replaced by more modest and limited approaches to motivation. These approaches do not presume to explain all motivational phenomena; their domains are more restricted. The study of goal setting is one such limited approach"[p.125]. They argue that goals give direction: "most fundamentally, goals direct attention and action" [p.131]. The usefulness of goals as a motivation theory is that they involve *directed* activity and not just activity per se.

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2. While these findings further confirm goal theory, the quality of this particular piece of research must be questioned.

Locke et al. distinguish between goal difficulty and task difficulty. They suggest that "goal difficulty specifies a certain level of task proficiency measured against a standard, whereas task difficulty refers simply to the nature of the work to be accomplished". However, the two may be linked as a goal can become the task. For example, consider the cases of a runner trying to break the four minute mile (goal difficulty) and an engineer trying to design a piece of space equipment (task difficulty). The runner's goal could be reinterpreted as being the task of understanding how to improve performance. In the same way a task may become a goal. The engineer could be said to have the goal of making equipment that works in space. It may be better to consider task and goals as "two hands that wash each other" with one being mainly the activity the other being mainly the direction.

Locke et al. [1981] divide the attributes of goals into content and intensity. Content includes clarity, difficulty, complexity and conflict. Goal *clarity* refers to how clearly activity is directed by the goal. At a simple level of abstraction the motivational impact of a goal is assumed to be positively correlated to its clarity. However, more *complex* goals may provide more motivation for more able managers who are interested in larger problems. Within limits, goal *difficulty* is also expected to be positively correlated to effort. Inter-goal *conflicts* at a simple level of analysis would be expected to reduce motivation but for more able managers they may provide the major source of interest and motivation.

Locke et al. [1981] use the term "goal intensity" to describe an attribute of goals which is similar to goal commitment. Goal intensity forms during the planning of a goal and during the process of setting and determining how to achieve a goal. Intensity is measured using factors such as the scope of the cognitive process, the degree of effort required, the importance of the goal and the context in which it is set. The motivation or direction gained from a goal would also probably be contingent on the ability of the manager involved. The motivation level of "more able" managers is expected to be positively correlated to goal intensity.

Expectancy theory, [Rockness,1977] like the other "process theories" of motivation, mentions the importance of goals. However, goal and expectancy theories are not completely compatible. Goal theory predicts that harder goals lead to better performance (within a credible range) whilst expectancy theory predicts lower motivation from harder goals. There is evidence to support both theories. In considering this conflicting evidence Locke et al. [p.128] suggests that, "one possible confounding factor is that subjects may not make their expectancy ratings conditional upon trying their hardest to reach the goal or to win. Thus, low expectancy ratings could mean that a subject was not planning to exert maximum effort".

Hirst [1987] considered the relevance of task uncertainty on the effectiveness of goals. He concluded that if the task uncertainty is high, then setting goals will be less effective than when task uncertainty is low. He defined high task uncertainty as "tasks that are both non-repetitive and open to significant outside influences". One reason for the impact of task uncertainty on performance is that the cognitive activity of strategy formulation must be learned [Naylor and Illgen,1984]. A difficult goal would demotivate only if there was no solving strategy or there was not an adequate supply of resources. The process of devising a solving strategy probably depends upon cognitive compatibility. It would be expected that group members with different cognitive styles would want different solving strategies.

Goal acceptance is another aspect of goal theory. It is tempting to believe that unless a goal is accepted it will not provide direction. The meaning of the word "accepted", however, needs clarification. If a task is performed satisfactorily then it seems reasonable to assume that the goal has been accepted. If a goal becomes a norm then acceptance may also be assumed to exist. However, even in these circumstances an actor may not agree with the goal, and the "hands and the heart" may not be congruent. There is little compelling evidence of a correlation between acceptance of a goal and performance. Acceptance is usually measured by answers to

direct questions such as, "do you accept the goals...". Locke et al. found some evidence of higher performance when there were imposed goals. However, these results could be misleading because non-acceptance included the situation where a "reluctant" actor may have been committed to a harder goal than the one which was imposed. Also, actors may start a task giving the impression of acceptance but have low expectations, or no intention, of achieving the goal. Therefore, it could be argued that merely *starting* a task is not conclusive evidence of goal acceptance. The determinants of goal acceptance are not well established. Harrell [1977] used USAF officers[3] to demonstrate acceptance of external goals but their conclusions cannot be generalised because the actors were a carefully selected and highly conditioned group. Expectancy theory suggests that goal acceptance is dependent on the perception of the achievability of the goal relative to the rewards for achievement. Acceptance may also be moderated by intrinsic (achievement needs) and extrinsic (childhood socialisation, peer and community pressure) needs.

FEEDBACK

Locke et al. [1981] also considered the relationship between feedback and goal setting. Harrell's [1979] earlier study had highlighted their interdependence as his subjects perceived feedback as a clarification of goals. Locke et al. also concluded that the two concepts may be inter-related and that the best "direction persistence" came from the presence of both.

Feedback is part of a post-action control system. It is the provision of information to the planners and actors about their performance in relation to a goal. Given feedback, goals or actions may be changed. The type of change may be used to classify feedback [Otley and Berry,1980]. These include changes to the inputs, to goals, to the activity or to the control system. The feedback may be formal or informal; it may use any communication medium (e.g. body language); it may be positive or negative,

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3. The subjects had the rank and job title of the goal setter explained to them.

and it may be provided to an individual or to a group.

Feedback has usually been described in mechanistic terms but the literature [e.g.Ezzamel and Hart,1986] also refers to the impact of motivation, trust, control, self confidence, participation, commitment, self esteem, attitude, learning and satisfaction. Feedback is assumed to be a major moderating variable on performance.

Gustafson [1973] found no improvement in performance after verbal feedback and a decline in performance after written feedback. Rockness [1977] used the expectancy framework and found that feedback improved performance only slightly but significantly improved satisfaction. However, Luckett [1988] reviewed the whole feedback literature and concluded that the balance of the evidence suggested that feedback does improve performance.

Luckett [1988] also reported that feedback influenced the level of expectation of success. Expectation theory suggests that feedback will alter motivation levels for important outcomes. In this expectancy model feedback is an input rather than a motivator in its own right. The degree of effort is also probably related to the expectation level. As long as the expectation of success is positive, a positive response to feedback is expected. Repeated positive feedback should increase persistence and efforts provided that the expectation of success remains high and the outcome is important. The effect of negative feedback on the degree of effort and persistence is more complicated. Negative feedback on an important outcome may produce increased effort. Further more, moderating variables may start to act. For example, the identification of an alternative strategy may alter responses to negative feedback [Luckett 1988]. Negative feedback may cause actors to rethink their strategy and to devise an improved approach which may outperform the strategy of those who received only positive feedback.

Whether feedback is positive or negative depends upon the receiver's perception. This

involves assessing the feedback against such things as one's own goals, previous results, a supervisor's attitude or a peer's average performance. Also, the actor may be "satisfying" [Simon,1955] rather than optimising. A supervisor or a peer may perceive feedback as negative but the actor may perceive it as positive.

Luckett comments that the perceived accuracy of feedback is dependent on its direction, the number of sources and by the organisational (psychological?) distance between the source and the receiver. The greater the organisational distance the greater the perceived accuracy.

The impact of feedback on performance has been found to be moderated by: i) changing the frequency of the feedback (one becomes "hardened" to criticism with experience): ii) the use of descriptive objective terms rather than evaluative emotive terms and, iii) by displaying a willingness to help. The perception of whether the feedback was negative or positive might also be determined by these different variables. Luckett also found that the impact of non objective negative feedback is often reduced by the sender "diluting" the message. The impact of feedback also appears to be dependent upon the level of task predictability, the amount of knowledge that is available to the actor about the task and the ability of the subject to use that knowledge usefully [Luckett,1988].

Armstrong [1982a] found that feedback increases commitment to a forecasting procedure. He suggested that feedback is very similar to participation, and is subject to many of the same contingencies. Participation provides information on performance in much the same way as with feedback. However, much of the experimental work on feedback and performance has used a much less detailed form of feedback than is suggested by participation. Mann [1957] found that feedback affected attitude, and Strickland [1958] found that increased feedback reduced trust. Wason [1968a] did not find that feedback changed subjects from looking for confirming evidence to looking for disconfirming evidence. Cooke [1906] suggested that feedback is also useful for

reducing over-confidence.

Feedback provides direction to a motivated group in much the same way as goals. The reduction of negative feedback becomes a goal. The reduction of negative feedback is also mentioned as part of expectancy (motivation) theory. However, feedback may also have a motivating influence [Nadler, 1979,p.311] in its own right. These motivations partly depend on interpersonal behaviours. "Feedback is seen as contingently leading to affective and cognitive outcomes, including level of attraction to the group, pride in the group, motivation, defensive feelings, and acceptance of group problems" [Nadler, 1979,p.309] The direction and the magnitude of motivation for goal achievement arising from feedback appears to be contingent [Luckett,1988; Eggleton,1988; Ilgen et al.1979,1984; Larson,1984].

First, the effect of feedback on performance is contingent upon the information it carries. For the maximum effect on performance, feedback should include more than the task properties (information about the task). It should also include information about the expected correct response and the judgement strategy being used by the actor. It should help the actors to determine whether they are going about the problem in the correct way. Wason's [1968] work on number sequences suggested that people tended to look for confirming evidence rather than disconfirming evidence. Feedback about the strategy used rather than about accuracy may have been more useful.

The format, or the way in which feedback is communicated, has also been found to be an important determinant of its motivational impact. The format may be written, oral or visual. Feedback in graphic form cannot automatically be assumed to be superior. The empirical evidence on schematic faces [Eggleton,1988] suggested that those using a graphic form outperformed those using tabulated data. On the other hand, DeSanctis [1984] using normal graphs and tables, found that those using tables performed better. If the format is "voluminous", information saturation would be expected.

Ryback [1967] observes that the detail of the feedback is important. He noted that a simple feedback on the accuracy (evaluative) of a forecast alone produced different responses from a more detailed feedback (descriptive) from which mistakes could be fully analysed.

The source of feedback could be organisational (such as accounting reports), from an immediate supervisor, from co-workers, from the actors or from the task. The source of feedback will affect its usefulness. The source will determine the user perception of the feedback's usefulness, credibility and reliability. The relative "power" of the sender and the receiver may also be important. Being the source or the first receiver of feedback gives information-based power that might threaten interpersonal control needs. Luckett [1988] found that intrinsic (self, task, co-workers and close supervisor) sources had more influence than extrinsic (organisational) sources but that perceived credibility may moderate its effectiveness. Interpersonal orientations may also effect the relative usefulness of intrinsic sources.

Accepting the limitations [Becker,1967] of her experiment, Cook [1967] found that attitude and performance were positively correlated with the frequency of feedback. Chhokar and Wallin [1984], however, found that performance was not affected by changing from a weekly to a fortnightly feedback. There is probably an optimum amount of feedback especially when dealing with data containing random errors. Whilst more feedback might provide more initial commitment and intrinsic motivation, too much feedback could cause confusion between random errors and trends. Mock [1971] found that learning decreased considerably after a few periods. This was consistent with Learning Curve theory. The impact of feedback would be expected to be lower for experts. If receivers believe that they understand a situation then negative feedback would probably be attended to less enthusiastically than in other circumstances. This result may also be predicted from Anchoring Bias.

Much of the feedback literature is primarily concerned with individuals. Feedback to groups is more complicated. Nadler [1976,1977,1979] suggested that group members often blame others for negative feedback but claim positive feedback for themselves. This may lead to interpersonal pressure within the group and to changes in group cohesion. He found that "group attraction" [1979,p.324] was determined partly by feedback. The maximum effect on cohesion was achieved by providing individual members with feedback as well as providing feedback on overall group performance. He found "less interpersonal strain" [1979,p.324] from providing only group feedback. He also found that a close group is likely to pay less attention to external feedback, to communicate feedback within group more quickly and to be more likely to modify negative feedback to individual group members. Even when group cohesion increases with feedback, changes in the group's performance (or attitude) depend on the group acceptance of the external feedback.

Some behavioural reactions (e.g. heed the feedback but discredit the source) to feedback were mentioned above. There are also cognitive and affection problems in interpreting feedback. "Cognitive responses involve the reassessment of expectancy beliefs about task achievement and changes to the individual's own behavioural standards or goals". Later: "Affective responses relate to the feelings the individual has to the feedback itself (for example, satisfaction with performance) and towards the feedback appraisal system" [Luckett,1988,p.16]. Eggleton [1988] suggested that scores on a locus of control measure and interpersonal working relationships would be likely to affect the response to feedback. Hogarth [1980] wrote that human information limitations and biases may also influence response to feedback. Staw's [1976] work on entrapment argued that there may be cognitive reasons why the evidence presented in feedback might be resisted. For example, some people may refuse to accept their forecast errors until they have gestalt closure on their ability to understand the process being forecasted.

Goldman [1965] suggested that ability may affect the usefulness of feedback. It has

been implicitly assumed that recipients of feedback have the ability to understand its ramifications and the ability to design and to implement alternative strategies. Goldman, working with individuals and dyads, concluded that high ability and low ability recipients do not gain as much from feedback as medium ability[4] recipients. This is probably partly because high ability recipients had little room for improvement and low ability respondents were unable to use the feedback effectively. He also found that dyads were more responsive to feedback than individuals, with the highest effect being on low ability dyads. He concluded that the dyad mix of abilities would affect the response to feedback in much the same way as Tziner [1988] suggested that Equity and Similarity theory would predict the effect of group mix.

Conclusion

The objective of this section was to consider how compatibility was related to performance.Motivation changes activity into performance. Achievement needs, interpersonal orientations, goals, equities, expectancies, feedback and perhaps norms all appear to affect motivation. The norms literature appears to be incomplete and feedback seems to be dependent on many moderating variables. Feedback is information and therefore dependent on all the factors that affect information. The key variable appears to be goals. If the group sets or accepts some goals then the motivational variables become relevant.

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4. If ability is a function of long term motivation levels then this provides an alternative explanation of the response to feedback.

PARTICIPATION

The term "participation" suggests group activity. The relationship between participation and group compatibility is not explicit in the literature. In spite of the large literature on participation in budgeting, participation has not defined in detail. Most of the research about participation has been at the individual level [e.g.Brownell and McInnes,1986], even when it has been considering personal differences [Gul,1984]. An exception is Chenhall's [1986] work on manager-subordinate dyads. Much of the research has been concerned with whether goals are more realistic if subordinates participate in the goal setting process. It is usually assumed that managers can insist on participation. However, it can be argued that participation is a personal choice and that managers can only encourage or discourage it in group problem solving. The degree of participation that actually occurs may be dependent on the inter-personal needs of the group members. Compatible managers would probably participate with each other regardless of the level of formal encouragement from more senior managers. Incompatible managers, on the other hand, would probably resist participation even when required to do so or when the task warrented it. The present study concentrates on the inter-personal desire to participate.

Participation has been defined as the amount of influence and involvement individual group members have in the creation of ideas, decision making, implementation and evaluation of the group's activities [Armstrong,1985; Brownell,1982]. Participation may be real or perceived. "True", as opposed to "pseudo", participation requires "...combining both the availability and exercise of free choice" [Ezzamel and Hart,1987]. True participation means that the personal needs of participants are considered. The definition includes the words *involvement* and *influence* both of which are inter-personal needs and desires[5] [Schutz,1966]. The desire for involvement and influence are less likely to be task specific than personal characteristics [Schutz,1966]. Much of the early participation research is based on the work of

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5. See Schutz's definitions of inclusion and control, Chapter 3.

French et al. [1966]. They used a variable called "independence-needs" which is rarely referred to in the more recent budgeting research. The inclusion of this variable suggests that French et al. believed that some people might not want to participate in group activities despite managers' wishes. The degree of participation that satisfies a person will depend upon that person's independence needs. For some, pseudo participation is enough. Senior managers may attempt to encourage or discourage participation but if the group members are incompatible in independence needs then true participation would probably not occur.

There is little understanding of how participation affects performance. "Cognitive benefits" such as a "clarity of objectives and means" have been suggested [Kren and Liao,1988]. However, the two studies [Kenis,1979; McInnes and Ramakrishnan, 1987] using the cognitive benefits approach have had inconsistent results. Despite the problem of determining the factors that influence true participation [Brownell,1982], they appear to be the similar to those which determine compatibility. These include good two-way communication, good attitudes, high motivation, and satisfaction or a feeling of cohesion. Hofstedt [1968] believed that participation acted through motivation[6]. Which may result from intrinsic valences, group cohesion, task cohesion [Becker and Green, 1962], morale, or goal setting [Locke et al.,1981]. The ways in which participation may work are, therefore, similar to those for interpersonal compatibility. There is doubt about the causal direction of the relationship between participation and performance. "Does democratic supervision cause high performance, or is democratic behavior a luxury permitted only to supervisors whose subordinates are already highly productive"? [Ritchie,1976,p.57].[7]
However, the causal direction between group compatibility and performance is clear. Compatibility is a personal variable which influences performance. Performance would not be expected to alter personality to any significant extent.

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6. The conection between group work and motivation was mentioned previously.
7. Note this again assumes someone "allows" participation.

Brownell's review article [1982] lists some of the variables that have been suggested as determinants of true participation. Each of these variables has an interpersonal implication. The first is "culture", which has both national and organisational aspects. It is suggested that the "amount" of participation to maximise group performance varies between cultures. The meaning of "amount" is unclear. Culture is a complex variable [Kroeber and Kluckholn,1952]. The distinction and the nature of the relationship between national and organisational culture is also unclear [Morgan,1986]. Participation and culture have a recursive relationship because the level of participation is one of the variables often used to describe culture [Morgan,1986]. Different cultures probably also have different interpersonal orientations [Schutz,1966] which help to define the cultures [Kroeber and Kluckholn,1952]. The term "culture" may, therefore, reflect different interpersonal orientations as well as determining the effectiveness of participation.

Other organisational variables that Brownell suggests may affect the level of participation include environmental stability, the manufacturing process, task uncertainty and task characteristics.[8] One way of viewing the way in which these variables affect participation is that they put different levels of stress on interpersonal compatibilities. For example, Schutz's [1966] comments that the task type will affect the particular group compatibility dimension which is the most relevant.

Brownell's list also includes group characteristics (including size, homogeneity, and skill level), the upward influence of the leader, the organisational level of the group, whether the group consists of high or low achievement needs persons, the level of trust and the speed with which the task must be completed. This set of variables has a clear association with interpersonal behaviour. Group size is relevant because high compatibility is associated with small groups. There is evidence that large groups divide into smaller compatible cliques [Knoke and Kuklinski, 1982] to satisfy

8. These include stressful tasks, interesting tasks, ambiguous tasks and difficult tasks.

interpersonal needs. Homogeneity and trust have also been mentioned as dimensions of compatibility. Tziner's [1986] work on ability and motivation using Similarity Theory, for example, suggests an association between compatibility and homogeneity. The upward influence of the leader also has a compatibility dimension, particularly in relation to control compatibility. Schutz comments that people with a high wanted control need will wish to obey seniors. Managers with high wanted control needs would want to participate with other managers only if they are effective intermediates with superiors who have control. The group's organisational level would also probably be correlated with the members' interpersonal scores. People with higher status in an organisation would probably have greater expressed inclusion and control needs. They would, therefore, be expected to want to participate. Skill may be used to achieve a role that is compatible with interpersonal orientation. Skilled people with high expressed inclusion and control needs would be expected to perform well in group activities. They have the skills which the group admires.

As well as the list of antecedent variables Brownell also indicates some "consequence" moderators, which are variables that influence the usefulness of using the "appropriate" level of participation. Variables such as locus of control and authoritarian personalities are mentioned. These variables also have an interpersonal dimension.

SLACK

Participation in budgeting by a group carries the risk that the participants will lower goals or exaggerate the resources required to achieve those goals. This is described as "building in slack". This "...internal payment to coalition members" [Leibenstein,1979] has often been mentioned in the management, the accounting [Cyert and March,1963] and the budgeting literature [Onsi,1973; Schiff and Lewin,1968,1970; Chow et al.,1988]. This aspect of budgeting may be a group compatibility issue.

Building in slack may be viewed in several ways. It may be a pessimistic view, a sensible buffer against uncertainty, a perception by a third party due to an asymmetric distribution of data, an inbuilt defence against bounded rationality, or the exploitation of a "normal propensity" in making a a forecast that attracts resources [Ezzamel and Hart,1987]. Schiff and Lewin [1968] suggest that slack is often accepted by all parties and managed in an open manner.

There may also be a problem from not having enough slack. Expectancy theory suggests that if a group is intrinsically motivated, then slack may not be normal group behaviour. A highly motivated group may be over optimistic. Indeed, the setting of optimistic goals may be favourably viewed as an indication of high group motivation. The profit forecasting literature [Cameron,1986] has formed over optimistic goals in prospectuses this suggests that the fear of public reaction when the actual results become known has not moderated such behaviour. Cameron [1986] and Otley [1978] both suggest that there may be more sympathy for "a trier who failed" than for a pessimist who is proved correct. An optimistic goal may be established if it is perceived that the gains from the promise of a high performance are greater than the consequences of not achieving the goal. Given the degree of the random errors associated with commercial forecasts, the measurement problems, the delays in reporting actual performance and a high level of competition for resources, optimistic goals (negative slack) should be expected.

Interpersonal behaviour theory suggests that highly compatible groups would exhibit less anxiety in goal setting and have more optimistic goals than incompatible groups. A compatible group would be in more danger of having too little slack rather than too much. Incompatible groups would be expected to compromise on the goals and to introduce slack to minimise intra-group conflict. Onsi [1973] reported a positive relationship between the level of authoritative control and the degree of slack. Cammann [1976] also suggests that reducing autoritative control has sometimes reduced slack. The higher the authoritative control (the expressed control needs) the lower

the likelihood that the group is compatible on control needs. This appears to be indirect support for the suggestion that incompatible groups would be expected to build in more slack. Compatibility theory, therefore, provides a moderating variable in the study of slack.

members about the impact of interpersonal behaviours on group performance. This would require the group member to become a "participating researcher'. The members would need to know why they acted as they did and why the other members acted as they did. If it was announced prior to the study that such a report was required it would have altered the behaviour of members. If unexpected interviews were conducted after the study, then members might not have observed the relevant issues. Further, the hierarchical staff/student relationship and the grading component would have made impartial responses questionable. If a qualitative study was required, then a totally different approach would be necessary. It would be necessary to observe managers at work and in their private lives. Their private behaviour would indicate their interpersonal behaviour. The study would observe the behaviour of members in a work group setting given the personality which they had displayed in private life. Further, the history and prior experiences of the members would be relevant. The perspective of the researcher would also be a relevant factor.

McCracken [1988] and Yin [1989] both argue that qualitative research is useful for complex issues which have inter-connected answers. Yin [1989] argues that qualitative research should be used for the "*how or why*" questions while quantitative research can be used to ask the "*what*" questions particularly when the variables can be manipulated. This study is concerned with issues such as, *what* effect does group participation have on performance and to *what* extent does self-selection result in compatible groups? The question of *why* compatibility affects performance cannot be asked until it is clear that it does. The issue of *how* compatibility affects performance is examined by a survey of the literature. If compatibility is found to affect performance then qualitative research may help in understanding other issues such as how goals motivate.

The scientific method is useful for research that manipulates variables. This study does consider the manipulation of variables. They include the formation of groups and the isolation of the task. In a natural setting it would not be possible to test if

self-selection resulted in compatibility. The task also needed to be isolated. In a natural setting other tasks would interact with the budgeting task problems.

McCracken [1988] argues that qualitative research is more relevant for problems that have not been clearly defined. It can be used to identify relevant research questions. In this study the problem was clearly identified.

Qualitative research is not specifically concerned with results that can be generalised to other situations. This study searches for a general rule about the impact of compatibility on group performance. The ability to generalise needs a "sameness assumption'. It is the cornerstone of scientific research. The assumption is that it is better to examine many subjects as there are more similarities than differences among individuals. The qualitative approach is to make a detailed study of individuals or situations, as a record of what occurred in this case.

METHOD

The Subjects.

The subjects for this experiment were one hundred and sixty third year management accounting students at Otago University in New Zealand. These students were in the final year of a three year degree and at the end of the year they would have completed the educational requirements to practice as accountants. They had passed university courses on budgeting and were familiar with the techniques relevant to the task in this study. The subjects therefore were reasonable surrogates for junior managers. They had many of the relevant skills and should not display too much subject bias [Greenberg,1987].

Horngren and Foster [1987] suggest that four is the optimum size for a budgeting group. Four has also been found to be an optimum size for work groups and often forms naturally in work cliques [Goldberg, 1971; Knoke and Kuklinski, 1982]. Therefore, the students were asked to arrange themselves into groups of up to four. As the groups were required to self-select, it was not possible to insist on the exact number of members in each group. Forty-one groups formed. There were twenty two groups with four members, eleven groups with three members, five groups of two members and three groups of one member. The three groups with one member were not included in considering compatibility scores. However, they were useful for the total ability, interpersonal orientation and cognitive style tests.

There were sufficient groups for a normal distribution and the calculation of non-parametric statistics [Dane,1990]. With group research there is sometimes a problem of "mortality'. Calculation of a group score is difficult if any one subject does not complete the questionnaires. There are two solutions to this problem. First, the missing score can be treated as blank data and ignored in the group score calculations. This may result in dubious compatibility scores. Second, the entire

Chapter 5: **HYPOTHESES and METHOD**

HYPOTHESES

The purpose of this section is to state more precisely what research questions will be tested in this study. After the hypotheses have been stated, the research method and the data analysis procedures will be explained.

Self Selection

The first aim of the study is to test whether members select each other based on interpersonal compatibility, cognitive compatibility, or ability. Considering each variable independently, the literature review of these three topics suggested that if members failed to perceive compatibility problems then group performance could be affected. As the research design for previous studies has typically been to force subjects into groups, there was no comment on whether the subjects could perceive any incompatibility. This study will use self selection to test the following set of hypotheses which are stated in the null form.

Hypothesis 1a

> *Ho: If group members are allowed to self select then they will not form interpersonally compatible groups.*

Hypothesis 1b

> *Ho: If group members are allowed to self select then they will not form groups of similar cognitive styles.*

The expected relationship between ability mix and ability compatibility is unclear. A group of similar ability suggests compatibility. However, groups of around four which report themselves as "compatible" often have one member with a very different ability

level from the other three. This "different" member may have a higher ability and be acting as a leader or may have a lower ability and be merely "tolerated" for some reason. Only a general hypothesis can be formed.

Hypothesis 1c

Ho: That groups will not form groups in any consistent manner with regard to ability.

Ability Mix and Performance

If there are groups with a range of ability compatibilities then the relationship between group compatibility and group performance can be tested. Performance was measured using forecast accuracy.

Tziner suggested that Similarity theory and Equity theory predict that group performance is influenced by group ability mixes. For example, three high ability group members will improve the performance of a fourth low ability member. Goldman predicts that groups of similar ability will exaggerate that ability. For example, high ability groups will outperform their individual expectations. The leadership theories, on the other hand, suggest that group performance is associated with the ability of the most able member. The second hypothesis is concerned with the relationship between ability mix and performance.

Hypothesis 2

Ho: That the particular ability mix of the group will have no effect on forecast accuracy.

Interpersonal Orientation

It was argued in the literature review that groups of members having a high inclusion

score would prefer working in a group, and thus perform better. It was also suggested that expressed control scores may reflect achievement needs or competitive attitudes, and that groups with high expressed control scores may be highly motivated. These two suggestions will be tested.

Hypothesis 3

Ho: That there is no association between a group's total score on inclusion and its forecast accuracy.

Hypothesis 4

Ho: That there is no association between a group's total score on expressed control and its forecast accuracy.

Schutz suggested, an association between interpersonal compatibility and performance. Hypothesis 5 tests that relationship.

Hypothesis 5

Ho: That there is no association between a group's interpersonal compatibility and its forecast accuracy.

Cognitive style

It was suggested that incompatiblity in cognitive style may affect a group's performance. It was also suggested that all the cognitive styles should be present for maximum performance. This contrasts with the idea that there is a particular cognitive style which is best for budgeting. An association between the group's total score in any one cognitive style, and that group's performance will be tested. The association between cognitive style compatibility and performance is also tested.

Hypothesis 6a

Ho: That there is no association between the cognitive style mix of a group and its forecast accuracy.

Hypothesis 6b

Ho: That there is no association between a group's total score on any particular cognitive style and its forecast accuracy.

Further, the notion that if one member of a group has particular cognitive skills then this will effect group performance is also tested.

Hypothesis 6c

Ho:That there is no association between a group's highest score on any one particular cognitive style and its forecast accuracy.

Two measures of compatibility have been separately developed. They are interpersonal and cognitive compatibility. It is unclear whether the same constructs are being measured or whether certain cognitive styles have particular interpersonal orientations. The presence of any association between these variables will be tested.

Hypothesis 7a

Ho: That there is no association between cognitive style and interpersonal orientation.

There was some concern that cognitive style is a similar construct to ability. This relationship will be tested.

Hypothesis 7b

Ho: That there is no association between cognitive style and ability.

Feedback

The literature review suggested that the presence of negative feedback would induce stress and influence group performance, depending on its compatibilities. Incompatible groups would be expected to waste more time on incompatibilities and have inferior performance. Negative feedback on compatible groups would be expected to work to reduce over confidence (optimism) and improve performance. Further, it was suggested that the impact of feedback would be associated with previous performance and ability.

Hypothesis 8

> *Ho: That any association between compatibility and forecast accuracy will not increase with feedback, regardless of the group's previous experience or ability.*

Performance

Group performance is expected to be a function of ability, compatibility and the application of the appropriate cognitive styles. The last hypothesis brings together all the previous hypotheses and tests whether performance is associated with ability, interpersonal orientations, cognitive style or any compatibility associated with these variables.

Hypothesis 9

> *Ho: That forecast accuracy is not dependent upon group mix with regard to ability, interpersonal compatibility, or cognitive compatibility.*

METHODOLOGY

This study uses a quantitative or "scientific method" as the term is used by Abdel-Khalik and Ajinkya [1979]. The Quantitative method, meaning nomothesis, is typified by a hypothetic-deductive approach; measuring and statistically testing pre-defined constructs. This is contrasted with the qualitative [McCracken 1988; Yin,1989] approach. The Qualitative method, meaning ideograpy, includes, "interactionism, phenomenology, hermenuetics,ethnomethodology, interpretive sociology and antipositivists of all kinds" [McCracken, 1988]. The present study is not concerned with the important issues associated with Critical theory [Held,1980]. Its ontological perspective is of realism. For example, compatibility and performance are discussed as if they are objective facts. This approach is widely taken in contemporary accounting research [Chua,1986] and is also extensively used in other social sciences and natural sciences. Context is achieved through the choice of subjects, the task used and the problem considered.

Using Burrell and Morgan's sociological paradigms [1979] this study would be classified as a "social psychological study" within the broader category of "functionalism'. Social psychological studies have been described by Hopper and Powell [1985] as follows.

> Social psychological approaches to management accounting are essentially complementary to human information processing ones. Both seek to reduce dysfunctional consequences of accounting systems by improving their design. Social psychologists however concentrate on motivation rather than information processing. Typically their research takes a defined budgetary variable like participation and relates it to social psychological factors such as interpersonal relations between peers and supervisors.

Chua [1986] has criticised Burrell and Morgan's classification scheme for its strict dichotomies and "latent relativism'. She suggests that it is possible for research to fall into more than one of the classifications. The change of "latent relativism" refers to their use of realist terms in reference to social interpretative theories.

However, the classifications are useful to introduce the issues of Critical theorists.

It is the concern of the writers in Critical theory [Held,1980; Tinker, Merino and Neimark, 1982] that "scientific research" is undertaken in the social sciences generally and accounting in particular, to ratify the dominance of capital over labour. Therefore, they see much of the accounting research as being an attempt either to emphasise the importance of capital or to provide advice to the controllers of capital how to more efficiently control labour. They would rather that accounting research concerned itself with the emancipation of people, including labour, by making the social controls of language and structures explicit. The supporters of critical theory believe that the better vehicle for their work is qualitative research. They are therefore not supporters of the quantitative style of research for social studies.

This study is concerned with group compatibility at any level of an organisation. It is accepted that its findings may be used by senior managers to ensure better performance by junior managers. However, the study should be distinguished from research which is primarily concerned with encouraging employees to maximise their efforts to achieve the goals of the controllers of capital. The study is not advocating that the "possibility of control and manipulation constitutive in such scientific explanations" [Chua,1986]. The findings should also be useful to group members who wish to explain or manipulate their own immediate environment. The study does not question the established power base in commercial organisations but if interpersonal orientations are perceived as an environmental pressure then it provides some information about how people are controlled by their environment. It does not consider how the environment determines interpersonal orientations.

Researcher independence is an important issue in research methodology. Although various levels of participation [Sless, 1986] are possible, qualitative research is usually characterised by a high level of researcher participation in the task. The scientific (quantified) method assumes that the researcher is "value free" and an

independent objective observer. Herzberg [1966] illustrated the impossibility of independence even in natural science research. The ontological, epistemological and human nature beliefs [Belkaoui, 1987] of researchers make observer independence impossible. In addition, biases and limitations in human information processing [Rosenthal,1968] may cause problems with the validity of observations. Awareness of these interaction effects is not sufficient to neutralise them [Armstrong,1985]. Even if the researcher could be made "value free" those who are observed are not. Under observation the subjects cannot be expected to act in a "normal" manner. Empirical studies have shown that subjects act to please the observer or at least to make an impression [Sigall, Aronson and Van Hoose,1970]. The scientific method assumes that these problems can be minimised by good research design.

This study assumes that the researcher is sufficiently independent to allow observed group performance to be generalised to other situations. The assumption of the independence of the researcher leads to a belief that scientific theories can be tested [Chua,1986]. This study, therefore uses the hypothetical-deductive mode of setting hypotheses and testing them. The approach is one of confirmation rather than falsification. However, the usefulness of the falsification concept is acknowledged. Following Hempel's [1965] suggested approach, a general principle is first established. This is followed by a prior condition and a resulting explanandum. The main general principle used in this study is that "group compatibility will lead to increased performance'. The main prior condition is that "the group has accepted the goals used to measure performance'. The resulting explanandum is that "budgeting groups consisting of compatible members will more accurately predict the implications of their decisions than groups consisting of less compatible members'.

The study also adopts the "scientific" stance of searching for constant and causal relationships. This reflects the realist assumption that variables exist and lack any self-determination. The critical theorists, on the other hand, argue that relationships exist only because of long term structural language, economic and social

pressures [Held,1980]. If people are aware of these pressures then the relationship may change. The approach taken in this study is that these long term pressures mould interpersonal orientation. Self-determination or self-interpretation are not considered. Schutz [1966] and Keen [1973] both argue that these characteristics are stable over a reasonable time period as they are the result of childhood experiences. Stability of characteristics is a necessary condition for the identification of universal rules and causal relationships. The rationale for the "scientific" approach to research on personality, which treats people as if they are molecules, is that it may assist in their emancipation.

The scientific approach, therefore, assumes that groups will settle into a stable state. It is unclear whether this is the normal behaviour of people capable of "self-realisation" and "self-interpretive" behaviour who are also able to create their own social structures. Group members may *choose* to make the group compatible and subsequently *choose* to make it incompatible. These changes may be to meet the needs of individual members. For example, it may be unreasonable to expect a single stimulus (prior condition) such as feedback to cause members to change their performance. It is possible for human subjects to conduct their own social experiments. This is not an option which is available to the variables studied in the physical sciences. "Unlike chemical compounds and other things of interest to natural science researchers, the people who make up organisations, and thus organisations themselves, may behave differently if they become aware of the research hypothesis about them" [Behling,1980].

This study also reinforces, without condoning, the mainstream accounting researcher's assumptions about the social world [Belkaoui,1987]. For example, it assumes that people will accept goals aimed at improving return on capital. The importance of the traditional ROI goal is reinforced in the subjects' minds. It is assumed that subjects accept the dominance of capital and that their performance is measured against this criterion. The study also assumes that there is no collective existence,

and that a group's goals can be measured by reductionism. A group's goals are the sum of the goals of the individual members. The need for members to have goals is assumed from the notion of "purposive behaviour" [Chua,1986]. Further, it is assumed that group members will be "rational" and "maximise utility'. For example, they will not like conflict and they will object if they have more work than another member who is getting the same rewards (psychic or financial). This assumption is questioned by Critical Theorists.

The task reinforces the notion of the usefulness and relevance of accounting information for commercial decision making. It is asumed that the data has exact values and clearly stated relationships with other variables. There are no valuation or causality problems. It is assumed that the survival of the firm depends upon the accurate calculation of numbers. This approach reinforces cost accounting as a rational, scientific, impartial, practical approach to decision making rather than as a political tool for accumulating power and exerting influence [Tinker, Merino and Neimark,1982]. The "political" aspect of cost accounting is, therefore, acknowledged but ignored. If the political aspect of cost accounting dominates the usefulness of the "calculation" aspects, then this study would be misdirected in its selection of the details provided with the task. However, it would not be misdirected in the importance of group compatibility in relation to performance. If the details of the task had had more opportunity for political manipulation then incompatibilities would probably have been more relevant to performance.

This study assumes that incompatibility is dysfunctional, unless it stimulates the analysis of the problem and leads to improved performance. For individual members, however, incompatibility may be the result of social freedom or the birth of an independent creativity [Chua,1986]. The Critical Theorists argue that this struggle for social freedom or creative independence is a threat to group organisers. Supporters of critical theory therefore, object to accounting research treating dysfunctional behaviour as undesirable. The issue of dysfunctional behaviour

highlights the assumption that the group is more important than the individual in "scientific" accounting research.

It has been advocated [Belkaoui,1987] that researchers should use both a qualitative and a quantitative approach.

> A thread linking all of these benefits is the important part played by qualitative methods of triangulation. The research is likely to sustain a profitable closeness to the situation which allows greater sensitivity to the multiple sources of data. Qualitative data and analysis function as the glue that cements the interpretation of multi-method results. In one respect, qualitative data are used as a critical counter point to quantitative methods. In another respect, the analysis benefits from the perceptions drawn from personal experiences and first hand observations. Thus enters the artful researcher who uses the qualitative data to enrich and enlighten the portrait [Jick,1979].

The difference between the qualitative and quantitative approaches can be seen in the measurement of human performance. The scientific or quantitative method would be interested in feelings, personality and attitudes only to the extent that they influence performance. Exponents of this method [e.g.Sekaran,1984; Emory,1985] would advocate the measurement of performance, feelings, attitudes and personality followed by tests for correlation. Qualitative research would be uninterested in measuring these variables but would rather *observe* the performance of people and draw conclusions. The concern would be with how a group achieved its performance, how goals where changed and how members altered the behaviour of other members.

As the approaches are complimentary both should be used. However, there are some problems in practice as it is difficult to use one research design for both styles. This study has, therefore, selected the quantitative method. It concentrates on measuring the independent and dependent variables while allowing groups the "privacy" to allow interpersonal behaviours to influence performance. This research framework is unsuitable for qualitative research. For example, the presence of an observer would have introduced a member with a "high expressed control" into each group to which other members would have to respond. The presence of an observer may also interfere with motivation levels. In addition it would not be possible to question

members about the impact of interpersonal behaviours on group performance. This would require the group member to become a "participating researcher'. The members would need to know why they acted as they did and why the other members acted as they did. If it was announced prior to the study that such a report was required it would have altered the behaviour of members. If unexpected interviews were conducted after the study, then members might not have observed the relevant issues. Further, the hierarchical staff/student relationship and the grading component would have made impartial responses questionable. If a qualitative study was required, then a totally different approach would be necessary. It would be necessary to observe managers at work and in their private lives. Their private behaviour would indicate their interpersonal behaviour. The study would observe the behaviour of members in a work group setting given the personality which they had displayed in private life. Further, the history and prior experiences of the members would be relevant. The perspective of the researcher would also be a relevant factor.

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Horngren and Foster [1987] suggest that four is the optimum size for a budgeting group. Four has also been found to be an optimum size for work groups and often forms naturally in work cliques [Goldberg, 1971; Knoke and Kuklinski, 1982]. Therefore, the students were asked to arrange themselves into groups of up to four. As the groups were required to self-select, it was not possible to insist on the exact number of members in each group. Forty-one groups formed. There were twenty two groups with four members, eleven groups with three members, five groups of two members and three groups of one member. The three groups with one member were not included in considering compatibility scores. However, they were useful for the total ability, interpersonal orientation and cognitive style tests.

There were sufficient groups for a normal distribution and the calculation of non-parametric statistics [Dane,1990]. With group research there is sometimes a problem of "mortality'. Calculation of a group score is difficult if any one subject does not complete the questionnaires. There are two solutions to this problem. First, the missing score can be treated as blank data and ignored in the group score calculations. This may result in dubious compatibility scores. Second, the entire

group can be disregarded. This may cause problems with sample size. It may also distort compatibility scores. This study used both methods and compared the results.

No alteration of group membership was allowed after the start of the task. This was necessary to stop the resolution of incompatibility problems which were expected to alter group performance. Also, scoring would have been difficult. The study includes a test of whether incompatible groups formed. If alteration of group membership was allowed then the degree of change might have been a useful measure of incompatibility. However, it might also have resulted in an insufficient range of compatibility scores for the correlation tests.

The subject's ages ranged from nineteen to fifty years, were of both sexes and were mainly of European descent. Twenty percent had previously worked in clerical or accounting positions in commercial organisations. This information may be useful for determining subject bias. The groups were not random partly because they self-selected and also because it was impossible to randomise all of the non-tested variables.

> Fisher[1] envisaged an experimental design that was supposed to guarantee reliable scientific conclusions, whatever unknown extraneous influences happened to be at play. But ... unless we rank possible influences in importance, Fisher's recommendations are inoperable, for they would require innumerably many randomisations. On the other hand if we agree to make a judgement on what influences were important, then a surer way of balancing the conditions in the two groups would be to control for these significant factors. Randomisation as a remedy for the problem of nuisance variables is therefore either unworkable or unreasonable [Urbach,1985].

Alternatively, it could be argued that the range of dimensions used in this study includes all the major variables. Ability, personality (which includes friendships) and cognitive style are reported as the major variables affecting small work-group performance [Whetton and Cameron, 1984; Tziner 1985; Schutz,1966; Keen,1973]. The presence of another major variable that affects performance would not invalidate this

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1. Donald Fisher pioneered the techniques for testing statistical hypotheses that have been used for more than 50 years.

study. Finding a correlation between performance and the variables used will be useful in its own right. If intervening or moderating variables are subsequently found then this would be an improvement of the findings.

THE QUESTIONNAIRES

FIRO-B

A questionnaire designed by Schutz [1966] was administered after the task was completed. Subjects were requested to separate their feeling about their group's performance from their own feelings about the experience of working in the group. The difficulty of administering the questionnaire after completion of the task is that the students' scores might reflect the success of the group. There would then be a correlation between performance and inclusion scores. This problem is not likely to affect any of the other tested variables. It was believed, however, that students could separate their group's performance from their feelings about working in a group.

The questionnaire could have been administered both before and after the task. This was rejected because of "re-test" problems [Dane,1990]. It would also be difficult to decide which answers to use if there was a change of scores. The absence of a change in score would mean that the re-test was unnecessary. If the non-respondents were different for the two tests then the experiment mortality would be high. In addition, answering the questionnaires required a significant commitment in time and effort. To re-present the test might have caused some resentment which could have been reflected in non-responses or incorrect responses.

The questionnaire could have been administered only before the task. This was also rejected as many of the subjects had not had previous experience of this type of teamwork. They would therefore have a problem with commenting on whether they liked working in groups. Also, it is possible that if the questionnaire were given immediately before the performance of the task then the respondents could have enacted

the behaviour which they had recorded. For example, subjects who had recorded that they liked working in groups might then make a special effort to do so. It is well recorded that people can change their behaviour in this way. It is even encouraged in the role playing literature [Armstrong,1985]. It should be remembered that this problem is relevant only to the "inclusion needs" variables. It is hard to see how characteristics such as ability or cognitive style would be significantly altered by the timing of the administration of the questionnaire.

The FIRO-B instrument is well established and tested. Details can be found in the literature review and the appendix. In the Buro review of the FIRO scales, the reviewer commented that the: "Reliability of the scales is excellent with reproducibility coefficients at least 0.8, and most exceeding 0.9. FIRO - B shows good stability over time with test retest reliability coefficients for its subscales ranging from 0.71 to 0.82". In relation to content validity, Lifton wrote that: "Schutz argues that because of the Guttman scaling technique and high reproducibility coefficients, content validity for all the scales is implied if not established. However, users should keep in mind that the FIRO scales represent an operationalization of Schultz's theoretical model of interpersonal relationships". In relation to concurrent validity Lifton concludes that the evidence: "strongly suggests concurrent validity". For predictive validity he comments that: "the results suggest some evidence for predictive validity". Lifton expressed some concern over construct validity. He wrote that the: "evidence for the scales' convergent validity is minimal". The intercorrelations between scales suggest that a clear construct has not been formed. For example, people might have both a high expressed inclusion need and a high wanted inclusion need. Floyd [1988] compared the FIRO-B instrument with a Living Group Questionnaire which was expected to be a similar concept. He concluded by supporting the validity of FIRO-B. Hurley [1989] questioned Floyd's work because it relied on self-report. Hurley was unsure whether self- report is as accurate as a report by informed others. He was concerned that the instrument measures intrapersonal orientations rather than interpersonal orientations.

Keen's Questionnaire

Keen's information processing styles instrument is less popular than the Myers-Briggs instrument. It measures information processing style rather than personality. However, Keen acknowledges that there is a correlation between one of his dimensions and the Myers-Briggs instrument. He, therefore, provides evidence of the concurrent validity by testing his instrument against the Myers- Briggs instrument, McKenny and Keen [1974] reported significant results from the Keen instrument and Johnston and White [1982] have reconstructed it using "paper and pencil" tests to confirm its validity. The questions in the instrument are presented in an "either-or" manner making it unsuitable for consistency testing using inter-item or split-halves reliability tests. Keen derived the questionnaire from the performance of the subjects on a series of tests which provided evidence of concurrent and predictive validity. A lack of inter-correlations between the two dimensions of the measures of his instrument supports the likely presence of clear constructs. Keen predicts that people are bi-modal in their cognitive styles. However, he also suggests that some people do not have developed a preferred style and others can "switch" styles at will. As the proportion of people who have more than one style is unknown, it is not clear if a normal distribution of cognitive styles can be expected.

"Faking" responses is a problem with questionnaires. To discourage this, students were advised that the results could be helpful in their careers. They were informed that the scores would be used in a research project but were no given no details. This overcomes some of the criticism that there may be "faking" in responses to "personality" instruments. The situation is different from, say, an interview where the subjects having little to gain from giving honest responses. In this case honest results were useful to the subjects. Any suggestions of situational personality were reduced by relating responses only to the assignment experience.

The Task

The task used in this study is the non stochastic, budgeting, simulation exercise designed by Goosen [1973]. Each group manages one company whose performance and actions do not directly affect any other group. Each group comprises the marketing, production, accounting and general managers of a small manufacturing concern. The members are provided with forty pages of information on the cost structure and behaviour of the simulated company. For example, they are given details of product costings, machine speeds, replacement costs, running costs, the impact of price, stock-outs and various marketing policies on sales levels plus the costs of various sources of capital. Each group must establish a general policy and set specific objectives from which a budget can be prepared. The budget should provide details of the resources needed to implement their policies and should also indicate whether the objectives are achieved. Students are required to appreciate the advantages of having goals and budgets, without which the submission of "accurate" targets is virtually impossible. Co-ordination of resource use is required. Guesswork could result in serious shortages of some resources. The preparation of the budget is the "strategy formulation" process refered to in the learning and feedback literature. The task is large, complex, and non-divergent. There is not one correct way of acting and knowledge of the actions of other groups is of no assistance.

The task requires students to make twenty-five decisions about resources for each of three periods. For example, they must indicate how much they wish to spend on advertising, wages, and new machines. They must also nominate capital requirements, credit periods and planned production units. They submit these decisions as input to the computer. At the same time they must submit four predictions[2] of the effect of their decisions. These predictions are for sales revenue, ROI, closing accounts payable and the material stock quantity.

2.The term prediction is used in place of forecast as the latter suggests the presence of random variables. The task in this study did not use any random variables.

The decisions were processed by Goosen's computer program (merely a formal algorithm from the details given to students in the instructions). This program determines the effect of the decisions, and produces a detailed manufacturing profit and loss statement and a balance sheet. Performance for a group is measured as the size of the difference between the group's predictions and the computer's calculations. It is, therefore, possible for a group to produce completely accurate predictions. The complexity of the variables is such that only one group, in one period, achieved no errors. The task is complex enough to ensure that the students suffer from information saturation.

The Performance Measure

An adjusted mean absolute percentage[3] is used to calculate the relative size of the difference between the computer output and the students' prediction. Armstrong [1985,p.346] recommends this as the most useful measure of prediction accuracy for this type of situation. Other measures were considered and rejected they are considered below.

The mean error [$\Sigma(A - F)/n$] can be zero if there are compensating errors. It is primarily a test of asymmetrical error, which may be appropriate if the costs of optimism are different from the costs of pessimism. It also provides an error measurement in units. In budgeting, optimistic forecasts result in opportunity costs from under-utilised resources. Pessimistic forecasts, on the other hand, carry co-ordination costs, such as stock-out costs, resulting from over utilisation of resources. In this study the direction of the error is not important. Further, as this study requires multiple forecasts using different units (dollars and quantity) a percentage based calculation is necessary. The mean error measurement is, therefore, not suitable and is rejected.

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3. $MAPE(adj) = (\Sigma(F - A)/(F + A))/n$

With an absolute error measurement [$\Sigma \mid A - F \mid$], there is no distinction between the signs. The results are not unit-free making the summation of forecasts with different units impossible.

If the root mean square error [$RMSE = \sqrt{\Sigma(actual - forecast)^2}$] is used then there is no distinction between signs. The units used and the size of outliers could have a significant effect on the result. This could be useful if extreme errors were proportionately more costly than small errors. An example would be for high stock levels. While outliers might be very expensive in budgeting, for the majority of cases squaring errors results in distorted reports.

One way to provide a dimensionless error term is to report a percentage error. This also allows forecasts which have unequal absolute values to be compared. The mean absolute percentage error (MAPE) is also useful if the cost of errors is more closely related to the percentage error than to the absolute error. The measure becomes very sensitive as the divisor nears zero. The divisor most frequently used in the forecasting literature is the actual amount. Basi et.al. [1977] prefer the actual figure because it is at least a figure that actually exists (assuming no measurement errors). Symmetrical errors are also reported as being of equal size. In the budgeting literature the divisor is usually the standard (forecast) figure. This is because of a perception that the standard is set by management and that the actual is the result of the effort of those being appraised. In this situation the forecast (standard) may be more stable than the actual.

The MAPE has a bias favouring low forecast values. If (using the actual as the divisor) the forecast is zero, then the maximum error is 100%. If the forecast figure is very high then there is no limit to the size of the errors. For a small number of forecasts it might be more appropriate to use the median as it could better describe the distribution and be useful for comparing forecasting models. However, large errors will not be highlighted.

The adjusted mean percentage error uses the mean of the sum of the actual and forecast figures as the divisor. Whilst less intuitively obvious than the unadjusted MAPE, it is symmetrical in its bias and is less sensitive to errors in the actual data. Its range lies between 0% and 200%. The possible range of errors can be controlled by including a constant.

Theil [1958,1966] suggested using the RMSE in a dimensionless format. He presented two forms, with the second being concerned with changes in quantities. Armstrong [1985] argues that the approach is ill-defined, complex and has few advantages over other measures. It has seldom been used in the financial planning literature. However, the RMSE can be made dimensionless by using the average actual value as the divisor. This coefficient of variation gives similar results to MAPE but is more difficult to interpret.

It would appear, therefore, that if a unitless, symmetrical, direction-free error measure which can be controlled in its range is required, then the adjusted mean absolute percentage error is the most appropriate. Its main limitation is a sensitivity to a low divisor.

There are other advantages in using forecast error as a performance measure. It is resistant to "satisfying" [Simon,1957,1976] behaviour by the subjects. A group may be satisfied with a less than optimum result if it saves them work. MAPE as a performance measure makes satisfying difficult. Only a full understanding of the variables and their relationships would make it possible for a group to predict its performance. A group using guesswork in the first period would soon realise that a sub-optimal result cannot be planned.

In this study the mean absolute forecast error was stated in the range of 0% to 30%. The former means a perfect forecast and the latter a very large error. Perfomance was graded in the range 5% to 25% using a linear grading; a zero grade for a 25% mean

error and a 10% grade for a mean error of 5%. A 30% error represents the largest error that could be made from which recovery was possible.

The Setting

The study allowed the task to be completed in the subjects' own time. It is, therefore, possible to classify it as a field study, spread over seven weeks, measuring only personal characteristics and performance. The time allowed is sufficient for any interpersonal behaviour to develop [Bales and Cohen,1979,p.727; Hare,1976,p.255]. As mentioned earlier, Schutz [1966] argues that the length of time the group spends together influences the inter-personal behaviours which are expected to affect performance. The seven week period should allow inclusion and control needs to become apparent and may even be sufficient to allow affection needs to emerge. If the work load is evenly distributed over four members then the size of the task requires about twenty hours work by each member. The complexity of the task means that more abilities are required than for the usual paper and pencil tests. The freedom to organise meetings and to determine organisational structure ensures that incompatibilities can be expressed.

The design of the study means that there is no control of the hours invested by each group in order to complete the task. Gul [1984] suggests that cognitive style experiments require control of the time taken because the relationships between styles and tasks can best be measured by having the subjects complete a task under time constraints. However, in a work situation, it is more a matter of giving priority to tasks than having to work to imposed time constraints. If cognitive differences do not affect performance without time constraints then they are not relevant in this task. While this study is primarily concerned with cognitive compatibility, total cognitive style scores and performance are also correlated.

The study could also be perceived as a quasi-experiment [Dane,1990]. Subjects are not

randomly assigned to ability, personality or cognitive style classifications. Membership of groups resulted from choice.

> The key distinction between experimental and quasi-experimental research is the manner in which the participants experience the independent variable. Experimental participants are randomly assigned to conditions, whereas quasi-experimental research capitalizes on pre-existing differences among participants. Whenever such preexisting differences are the focus of research, quasi-experimental design may be more appropriate than their experimental counterparts [Dane,1990, p113].

It is not, therefore, possible to identify a direct cause and effect between personal characteristics and performance. It is however, possible to say that personality characteristics appear to be associated with performance. The quasi-experiment design does, however, result in greater external validity than an experimental design.

The perception that this research is a field study is justified on the basis that the task was a natural event for the students. In addition, there was minimal intrusion of setting, task or treatment [Dane, 1990]. However, "systematic observation" was not used as is usual with field studies. As it is intended to generalise the results to commercial budgeting, the study cannot be regarded as a "true" field study. Field studies can be used for testing causal relationships. "That field methods are most appropriate for exploratory and descriptive purposes does not mean that they cannot be used to address questions about relationships between variables" [Dane,1990]. "The way in which field research is typically used to test causal relationships involves taking an already experimentally tested phenomenon and applying it in a natural setting" [Dane,1990]. This study generalises the results from experiments. Tziner [1985] and Cattell [1971] have tested ability, Schutz [1966] has tested inter-personal behaviour and Keen [1973] has tested cognitive styles using experiments.

Chua [1986] warns of confusing confirmation and falsification. "Confirmation is the extent to which a hypothesis is capable of being shown to be empirically true, that is, of describing the real world accurately. Falsification is the extent to which a hypothesis is capable of being shown to be empirically untrue, that is, of failing to

describe the real world accurately" [Belkaoui,1987]. This study is not designed to falsify any of the theories used. It is more an attempt to confirm that the theories can be used with group self-selection and a large cognitive task. However, given the statistical nature of the issues being considered it is difficult to either confirm or falsify. This type of study assumes that the characteristics of people are normally distributed. Confirmation and falsification of a theory in an absolute sense may only mean an unusual sample. "There are hypotheses that are neither strictly confirmable nor strictly refutable. They are the hypotheses arising from statistical or tendency laws, that is, statements specifying a loosely specified statistical relationship between a phenomenon and a large number of variables. Most accounting hypotheses fall within this category, which makes them neither strictly confirmable nor strictly falsifiable". [Belkaoui,1987]

Feedback

Luckett [1989] suggests that the type of feedback is relevant. Descriptive feedback is a detailed explanation, impartially given, which allows subjects to discover exactly why their performance differed from the objective. Evaluative feedback merely informs subjects how they have performed relative to the evaluators expectations. It usually is given in the form of "yes" or "no". Improved performance, with task satisfaction, is considered more likely with descriptive feedback.

In this study, descriptive feedback is provided in two forms. There is a bulletin of the MAPE's of all the groups and a printout of each group's actual results in the form of a detailed manufacturing account and balance sheet, plus some general management statistics. The bulletin allows inter-group comparisons and the detailed reports allow students to discover their particular mistakes.

Subjects can also be provided with either task or process feedback [Luckett, 1979]. Task feedback informs the subjects if their results were near the objective. Process

feedback informs the subjects whether their method was correct. In this study, task feedback but not process feedback is given. Members can provide their own process feedback in more detail than is possible from outside the group. Incompatibility is expected to act through members criticising the processes used by their group. Extreme compatibility may mean that the group will not generate its own process feedback. This is the reason why a little incompatibility could result in a better group performance than perfect compatibility or extreme incompatibility. A slightly incompatible group may provide some useful process feedback without spending too much time and effort on criticising the group's processes.

Nadler [1979] comments that feedback within groups enhances the "equity" motivators. An inter-group comparison of performance, accompanied by adequate feedback, should motivate. Within groups there will also be an intra-group comparison, with detailed feedback. This is also expected to be a powerful motivator. The impact of feedback on group performance is, therefore, expected to be significant. This means that a useful study of group performance must incorporate multi-period tasks with detailed between-period feedback. The provision of feedback is an important aspect of this study.

Motivation

In addition to feedback, goals and peer-pressure, direct extrinsic motivation is provided. While students knew that the Goosen simulation was being used for research they were also aware that the task counted towards a coursework grade. 10% of the grade for one course was determined by the forecast error. Another 5% was earned by achieving a ROI in excess of 20%. Such extrinsic motivators cannot be easily generalised to managers completing a budget as part of their day to day duties. However, the members' intrinsic motivators are provided by their personality and are more easily generalised to a budgeting situation.

Motivation to fill out the instruments correctly was provided by informing the students of the usefulness of knowing their own interpersonal orientation and preferred cognitive style. The results from the instruments were made available to individual students.

EXTERNAL VALIDITY OF STUDENTS AS SUBJECTS.

It is argued that given the type of student and the task, students are reasonable surrogates for managers undertaking a budgeting task.

In the recent accounting literature students have been extensively used as subjects. The practice is now so common that in the major journals the use of students as experimental subjects no longer warrants even a footnote of justification [Schatzberg, 1990]. Schatzberg [1990] used unspecified undergraduate and graduate students in a laboratory market. Elias [1990] used unspecified undergraduate students in an information processing and conflict study. He cited several authors who also have used student subjects in similar research [Roth and Malouf,1979; Roth and Murnigham,1982; Notz and Stark, 1987; Chow, 1983, 1988; Aston and Aston, 1988]. Chow et.al. [1988] used forty unspecified college students in a budget participation study. Hilton et.al. [1988] used sixty three MBA students in a product costing study. Surieringe and Weich [1982] used accounting students in a laboratory experiment. Chalos and Haka [1990] used accounting and MBA students in a transfer pricing bargaining study. Schneider and Wilner [1990] used MBA students mixed with managers in a test of deterrents on financial reporting. Brownell [1981] used accounting undergraduates and a business game to study participation.

Typical of the arguments against using students as surrogates is that of Campbell and Stanley [1963]. They are concerned that students are not representative of the larger management population. They suggest that students are inappropriate on the basis of age, and intellectual, emotional and social-economic attributes. Others have identified other differences between students and managers, including, personality, needs, management potential, wealth, skills, experience, reaction to stress, and values. Again, "The controversy over using students as subjects in applied research has been a topic of philosophical discourse and empirical investigation" [Gorden et.al., 1986]. The latter writers reviewed thirty-two studies

and concluded that the gatekeepers of journals and theses "weigh carefully the appropriateness of experimental subjects', and ask for a priori theoretical and empirical justification of the choice of subject. They noted that some journals had an explicit policy of a vigorous review of research that has used students.

The argument about the appropriateness of using students as surrogates, however, appears to be contingent on three dimensions. They are (i) the research task, (ii) the type of students and (iii) the research objective.

(i) Task

The dimension of the research task was studied by Ashton and Kramer [1980]. They considered attitudes, decision making/human information processing and consumer behaviour. The attitude research showed noticeable differences while the evidence on consumer behaviour was mixed. The evidence on decision making, and the underlying information processing characteristics and bias, suggested little difference between students and managers. The results relating to information processing and interpersonal behaviour do not contradict the psychology literature [e.g.Schutz,1966] which emphasises that much of the classification of people into types occurs in childhood.

(ii)Student Type

Students are not homogeneous. To use first year psychology students in lieu of experienced bank or personnel managers is not comparable with using, say, accounting majors from an MBA course to represent management accountants. Further, as Greenberg [1987] points out, students may provide a better sample than managers selected from one organisation. Such managers may be non-random in sex, experience, motivation levels, cognitive style or interpersonal orientation. Managers of say an engineering company represent a further sub-selection of the national population, which may be

better represented by a student group. Mangement groups can be very selective of acceptable cognitive styles and interpersonal behaviour, demanding both a minimum and maximum level of motivation. These norms may not be generalisable to different industries, sizes of company, levels of management, corporate cultures and operating environments. Greenberg also points out that much of the research on the usefulness of student samples merely suggests that the results from one student sample have been reported as being different from those of another student sample. This does not prove that students do not represent some larger population. Research that used multiple management groups would be necessary to prove this point. Further, if the student sample does not give the same results as the management group, could this not mean that there is evidence that the results of the management based study should not be generalised?

(iii) Objective

The third dimension of the argument about the use of students surrogates is the research objective, which includes a consideration of the relationship of the reported research with the other research. Some writers believe that the absence of repeated experiments or at least a methodical progression in manipulating variables reflects the non-objectivity of the application of scientific methods in the social sciences [Gephart,1988]. However, experiments may be seen as being part of a family. Students might be used in a pilot study when access to managers is expensive and/or difficult (e.g. after bankruptcy). Students might be used when task manipulation (simulation) is required. Managers might not have the time or motivation for long or repeated contrived experimental tasks. Also, students might be used to test the external validity of an experiment carried out on managers.

In this research the student subjects were in the final year of their accounting degree, and many had, or would shortly have, commercial budgeting experience. The instruments used were testing interpersonal orientation and cognitive styles which are

believed to be reasonably stable over time. Whilst cognitive styles may change under stress, for these students a preferred style should have been established. The range of cognitive styles and interpersonal orientations available in the student group should be greater than for the management of any one company. Group research requires many subjects and a budgeting assignment with period end feedback is very demanding on the subjects' time. There does not appear to be a practical way in which this research could have been conducted using experienced managers.

ASSUMPTIONS and LIMITATIONS

This section specifies some of the assumptions which are implicit the overall study and the method.

Group Purpose.

The task in this research concentrated on the planning rather than the control aspect of budgeting. As a result of this concentration, implementation stresses are not considered. In some respects this is regrettable. A major attraction of group work is getting a commitment to assist with implementation problems. The subjects in this study would perceive the main advantage of being in a group as work and risk sharing, rather than commitment gaining. The absence of implementation problems reduces stress and may also reduce the impact of compatibility on performance. However, if compatibility moderates performance for less stressful tasks then it should be more applicable to control tasks.

In some cases commercial budgeting dominates a manager's working life. Some managers work only on budgeting while others see budgeting as only an incidental part of their employment. The resources and attention which managers apply to planning will probably reflect this perception of its relative importance in their role. Also, the importance of getting the plans correct will vary between organisations. The accuracy of the plan may not always be a determinant of a manager's future income. Some firms may operate in a rapidly changing environment and regard planning merely as a mechanism to make managers reflect on the future. For this type of firm, forecast errors will not be critical. For the experiment, however, forecast errors were considered important. In addition the task absorbed only a part of the student's working life. It is difficult, therefore, to generalise about the differences between the students' attitudes to the task and those of managers preparing an actual budget. The task should simply be perceived as a group information processing task.

If it found that group compatibility affects performance, then the results may indicate the relevance of compatibility to this type of task, which includes budgeting. The effect of the nature of the task on compatibility should be the subject of future research.

Group Life.

This research used newly and purposely formed groups. Although several weeks were allowed for group members to "get to know" each other, they had little time to gain experience of the assignment, and of working in a group. The interpersonal behaviour of a well established management group may be different from that of a temporary group. For example, it is possible that members of a temporary group could suppress their feelings knowing that the assignment will soon be over. However, this assertion needs to be empirically tested. It is possible that compatibility does not change over time. Indeed, it is hard to understand how time could alter personality variables such as a dislike for working in groups, a need to control others and a need to be loved. Outright aggressive behaviour may be suppressed, but orientation is assumed to be stable over time. This orientation may initially mean a concealed failure to commit fully to the group's activities. Later the explicit incompatibility may be revealed but both can alter the group's performance.

Compatibility theory is not concerned with a comparison of long and short term factors. It seems to assume that incompatible groups will dissolve in the long term. That is, in the long term, members will rearrange themselves into more compatible groups. This, however, assumes a totally free flow of labour and does not explain how marginal cases of incompatibility will arrange themselves.

Group Organisation.

The study deliberately avoided imposing internal organisation on the groups. For

example, no formal leaders were appointed, no attempt was made to establish any type of hierarchy and the task chosen assumed members with equal status. Hare [1976] suggested that organisational roles would be weak for small groups. He argued that there would not be enough members to form strong cliques or a hierarchy because communication would be direct. There would be no need for a formal organisational structure. This point was seen as an advantage of small problem solving groups. There would be no organisational processes to interrupt the group dynamics. Schutz predicted, however, that if there were any expressed and wanted control needs, dominant members would emerge. This study assumes that if there is a formal hierarchy in small management budgeting groups, then it will not cause incompatibility problems beyond those resulting from interpersonal orientations. Schutz argues that a formal hierarchy may be a problem only if there is incompatibility of control needs. For example, if the appointed leader has low expressed control needs and another member has high expressed control needs then the latter will assume leadership. If the formal leader and another member both have high expressed control needs then there will be incompatibility problems. However, this is a compatibility problem and not an organisational problem. Of course, the leader may have the power to make the group members act against their wishes. However, this study is only concerned with whether incompatibilities cause members to withdraw full co-operation and to reduce the effective performance of the group. Further, although commercial managers may have different organisational rankings, when a working group is formed, the interpersonal, cognitive, task cohesion and ability dynamics would be expected to dominate hierarchical differences. In addition, the organisational rankings may be the result of long term interpersonal, cognitive and ability dynamics. Therefore, it is probable that the organisational hierarchy is the same as the hierarchy that would form spontaneously in a newly formed budgeting group. It was also believed that the external imposition of formal leaders for the experiment would be ineffective as the group would rearrange itself or ignore the imposed hierarchy.

In this study intra-group participation practices were neither controlled nor

observed. Participation was not treated as an organisational variable and degrees of allowed participation were not measured. This was because participation was perceived as an interpersonal need, and not as an organisational variable. Therefore, group members participated to the degree that suited them. Some groups divided the task among themselves and met infrequently, whilst others tackled all the tasks collectively. The level of participation was an indirect measure of the individual's interpersonal needs. If the degree of participation results in a changed performance, then interpersonal variables affect performance. Therefore, interpersonal behaviour influences performance through the groups' participation practices. If there are advantages in a "tight" budgeting group then low inclusion needs or low control needs, resulting in low amounts of group participation will reduce performance.

Group Size.

This study used a group size of up to four people. Hare [1976] suggests that there may be a "natural size" for groups depending on the task. While it was argued that about four may be the optimum size for budgeting, the size of actual budget committees is not known. The social network literature supports the notion that management groups of around four are typical, but it also raises the issue of the "extent" of membership. The budget group may consist of a "hard core" with other people joining in a temporary capacity. How these ephemeral members are counted, and the impact of their interpersonal orientation, is not clear. In this study, group size was determined by the subjects. Most of the groups chose the maximum allowed size of four. However, once groups had been established it was unclear whether there was equal application by each member. There may have been "degrees of membership'. This would be partly determined by the task but also by the interpersonal needs of the members. It was not, therefore, possible to compare directly the size of the study groups with actual budget groups as *effective* size depends on interpersonal needs.

Satisfaction.

This study has concentrated on performance rather than satisfaction. The two constructs are interrelated and recursive. Increased satisfaction may lead to improved performance and good performance may lead to increased satisfaction. The dependent variable "performance', as measured by forecast error, was preferable over self-rated satisfaction because satisfaction may be dependent on compatibility and performance, and forecast error is a more "objective" measure than self-rated satisfaction. In addition, the measurement of satisfaction would have also resulted in a behavioural dependent variable. It is recognised, however, that satisfaction is an important variable in the performance of cognitive tasks such as budgeting.

Ability.

The study uses ability as a variable. Ability is a complex construct, which is ultimately defined by how it is measured. In this study ability was measured by management accounting examination results. The limited psychology literature on work groups and ability uses I.Q., or general knowledge to measure ability. This study, therefore, uses a more specific measure than much of the psychology literature. The extent to which the findings of this study can be generalised to a commercial setting is dependent on the relevance of examinations as a measure of the ability to produce accurate budgets. It is assumed that there is a high correlation between examination results and the ability to manage the task used in this study. Examinations require a wide range of abilities including interpretation, presentation, motor speeds, memory and thought scheduling [Cattell, 1971]. Some generalisation of the result may therefore be possible.

The Budget Task.

Budgeting includes the processing of large amounts of numerical data. However, the

analysis of the data might require different information processing skills from those used in actual budgeting. The task required a systematic analysis of the data which was provided. Actual budgeting, on the other hand, also requires the collection of the data which is later analysed. The additional task of data collection creates the problem of managing measurement errors. For example, a buyer might misunderstand how costs are compiled and set a price excluding rebates on containers. Identifing and dealing with this type of error may be more important than dealing with errors in computing information. This difference means that generalisation of the results should be limited to group data analysis tasks, rather than to collection and analysis tasks.

The study task did not use randomised data. Real data, such as sales forecasts, are often based on random data. The quality of the data changes the nature of the task and the stresses involved in preparing budgets. For example, not knowing the sales figure accurately has major ramifications for budgeting. There is a need to build in "slack" and contingency plans. The "holding back" of resources for contingencies may be a matter of much concern. These issues are often strenuously debated and are a major source of conflict. The absence of these conflicts limits the interpersonal stress to concerns about computation accuracy. Random data was not used in the study as it would have made performance measures difficult. This difference must also limit the extent to which the results can be generalised to a real budgeting situation. The task is a surrogate only for the information processing aspects of actual budget preparation.

Group Mix

Statistical analysis of group data is not well developed. The more powerful techniques, such as regression, assume independence and normal distribution of the variables. Theories such as similarity, interpersonal and equity theory were developed using dyads rather than groups. It is not clear how to measure something

described as "a mix of all cognitive styles'. Even with a group of only four, the number of possible combinations is very large. This aspect of the present study will have to be exploratory. A "data dredging" exercise, using a non-statistical computerised heuristic search of the type outlined by Forsyth [1984] and Saltzberg [1986], does not guarantee an optimum result. Findings would still need to be explained.

Forecast Error

The study uses forecast accuracy as the performance measure. This measure avoids some of the problems of a subjective dependent variable such as effectiveness. It is, however, a very different measure from production output or satisfaction which is used in most of the classic management literature. Forecast error is not a continuous measure like output. Error is more discriminate, which makes it harder for the subjects to "satisfy" For example, subjects may control the input of effort to produce 75% or 95% of the target output. With forecast error, such a control of performance is not possible. A failure to understand fully the impact of a variable on the outcome may result in an error of uncertain size. The task required a large number of forecasts each of which had a relatively small impact on the overall error percentage. Therefore, the error is a reasonable reflection of the amount of control which was achieved. This assumption is supported by the variance of the errors and their reduction with feedback. Students did not complain that results failed to reflect their effort. While not as continuous a variable as output, multiple forecast error is a more realistic measure of management performance.

The performance measure does not distinguish for the direction of the forecast error. In budgeting the direction of the error might be important. For example, to stop production due to a shortage of materials might be worse than to have a slightly excessive stock level. Knowing that the direction of the error is important would probably alter some of the decisions made when preparing a budget. However, it is

hard to estimate how this would affect generalising the findings from this study.

Goals and Motivation

Another difference between this study and commercial budgeting is the participants' goals and motivation. Relative complexities aside, the extrinsic goal of the students is probably the attainment of a high grade. For managers, the extrinsic goals are probably job security or promotion. Thus, there may be motivational differences. Other differences in motivation include the subjects' tolerance for "unreal" problems and the expectations of rewards from positive action. The relevance of these differences depends on whether they would result in different forecast errors for the two groups. The students have the demotivation of knowing that their task is unreal but, on the other hand, their goals are more explicit and quantified. Also, their feedback is much faster than would be expected in actual budgeting. Locke et.al. believe that this will lead students to higher performance and/or motivation. This could compensate for some of the differences between students' and career managers' extrinsic motivation levels. The intrinsic motivation to "get it right" might be similar for a student and a manager. Both could be motivated by such things as a desire to please or impress other members of the group, or personal satisfaction from a good performance. This study therefore assumes that intrinsic motivations will dominate the extrinsic motivations.

Another factor is the group's acceptance of externally imposed goals[6]. The external goals may not be internalised. Do students and career managers have the same attitude to externally set goals? The students are accustomed to externally set goals. Managers' goals are sometimes the result of participation. However, there is a limit to the extent that managers can determine their own goals. As members of a budget group, they have, to some extent, been selected as receptive to externally set goals.

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6. This study has assumed that acceptance of externally set goals at the individual level is correlated to wanted control scores.

Thus, the difference between student and managers as goal acceptors may not be large.

Feedback.

The section on feedback noted the asymmetry of responses to feedback. Does the task feedback have the same symmetry as budgeting feedback? If management groups adopt external goals (standards), then positive errors (variances) are generally perceived as a favourable event while negative errors are not. In the study an absolute measure of error was used. Therefore, all errors would be negative feedback. This difference may result in a slightly different motivational effect. However, it simplified the study by removing the need to identify the circumstances when a "positive" error would be undesirable.

It was also stated in the section on feedback that negative feedback, associated with clear goals, a coping strategy and enough motivation, could result in positive effort. Negative feedback was assumed to provide the motivation for an appraisal of the group's present strategy. Stress was magnified by making the team's performance public. This argument assumes that the group accepts the goals and rewards of getting a low forecast error. It was also suggested that highly compatible groups, given strong negative feedback, would have their overconfidence (optimism) challenged. Given the right motivation, and a constructive new coping strategy, this should result in the group achieving a preferable error score in the next period. It is assumed, therefore, that students will act in the same way as a management group in these matters. The assumption about coping strategies may be the most suspect. The students may have the advantage of a better communication system which should help them learn of alternative coping strategies. The student groups are working in close physical proximity with other groups working on the same problem. While "copying" is not feasible due to the complexity of the task, some general guidelines for alternative strategies may be available. A possible counter is that managers will have more experience of their company and of commercial life generally.

Time.

This study has not controlled for the time taken by each group when making its decisions. This is because different cognitive styles need different times to function effectively. A commercial budget is not required to be completed within a matter of hours so incorporating an hour limit would have been artificial. Some decision making, like Tziner's army tank crew task, does have a time constraint but budgeting does not. Also, the use of an artificial laboratory setting to control for time would not have allowed interpersonal and cognitive incompatibilities to fully develop.

CHAPTER 6: DATA ANALYSIS AND RESULTS

Introduction

This chapter presents the data analysis and the results. It is divided into four sections. They are; (A)interpersonal orientation; (B)cognitive style; (C)ability and (D)the interactive aspects. The final section of the chapter considers the inter-correlations between the other three variables and an overall performance model. A discussion of the results is presented in the final chapter.

The general approach is first to report the descriptive statistics, followed by some Pearson correlations to identify useful associations. Given the potential for some non-linear relationships a parabolic function was also occasionally used with some regressions. Finally, the results from the correlation tests were used to select variables for an overall regression model.

A. INTER-PERSONAL ORIENTATION

This section (Part A) of the chapter is arranged as follows.

Contents

A.2 Group Scores

A.2.1 Group Expressed Inclusion

A.2.2 Group Wanted Inclusion

A.2.3 Group Expressed Control

A.2.4 Group Wanted Control

A.2.5 Group Expressed Affection

A.2.6 Group Wanted Affection

A.3 Forecast Error

A.3.1 Period 1

A.3.2 Period 2

A.3.3 Period 3

A.4 Group Scores Against Performance

A.4.1 Total Wanted Inclusion and Performance

A.4.2 Total Wanted Control and Performance

A.5 Self-selection and Compatibility

A.5.1 Reciprocal Compatibility Inclusion

A.5.2 Reciprocal Compatibility Control

A.5.3 Reciprocal Compatibility Affection

A.5.4 Originator Compatibility Inclusion

A.5.5 Originator Compatibility Control

A.5.6 Originator Compatibility Affection

A.5.7 Interchange Compatibility Inclusion

A.5.8 Interchange Compatibility Control

A.5.9 Interchange Compatibility Affection

A.6 Compatibility and Performance

A.7 Feedback

A.1 FIRO-B INDIVIDUAL SCORES[1]

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1. For a complete listing of the data see the appendix

The descriptive statistics of the scores from Schultz's interpersonal instrument (FIRO-B) are presented first. These are the scores of all ninety-seven subjects used in the study. The possible range of scores is from 0 to 9 with an expected mean of 4.5.

It was necessary to deal with the data from incomplete groups. An incomplete group occurs because one member of the group does not provide a useable reply. In this study the data were analysed two ways. First, all missing data was treated as "blanks" when input to the computer. Second, only groups with a full set of replies were used. It was found that the results were not significantly different. Therefore it was decided to present the data only from groups for which there was a complete set of data.

A.1.1 Expressed Inclusion (EI).

For expressed inclusion the mean and the mode are fairly close but there is some negative skewness. The distribution is a little platykurtic even though the 99% confidence range is 3.38 to 4.27. The details are seen in the frequency table (Table A.1.1). The Kolmogorov-Smirnov (K-S) test suggests that the distribution is probably not normal. However, this non-normality is mainly due to the small number of "2" scores (see the frequency distribution). The U.S. national norm data reported in Whetten and Cameron [1984] states that 50% of subjects were between 4 to 7 with a mean of 5.4. This sample, therefore, has a narrower range of expressed inclusion scores and a mean below the reported U.S. national norm. This could be due to either cultural or professional differences.

Table A.1.1 Expressed Inclusion (EI) Scores.

EI	Number	Percent	Cumulative
0	3	3.1 %	3.1 %
1	10	10.3 %	13.4 %
2	5	5.2 %	18.6 %
3	21	21.6 %	40.2 %
4	24	24.7 %	64.9 %
5	14	14.4 %	79.4 %
6	18	18.6 %	97.9 %
7	2	2.1 %	100.0 %
Total	97	100.0 %	100.0 %

Minimum = 0

Maximum = 7

Mean = 3.8

Median = 4

Mode = 4

Standard deviation = 1.7

Standard error of the mean = 0.17

99 % confidence interval around the mean = 3.38 - 4.27

Skewness = -0.34

Kurtosis = 2.45

Kolmogorov-Smirnov statistic for normality = 1.38

A.1.2 Wanted Inclusion

For wanted inclusion the mean and the mode of the distribution of scores are not close and there is some negative skewness. The distribution is rather platykurtic with the

99% confidence range of 3.87 to 5.56. The details of the distribution of scores are shown in Table A.1.2. The K-S test suggests that the distribution is probably not normal, mainly due to the large number of zero scores. The U.S. national norm data for wanted inclusion states that 50% of subjects were between 5 to 8 with a mean of 6.5. This sample, therefore, has a mean value which is less than the US national norm.

Table A.1.2 Wanted Inclusion Scores

WI	Number	Percent	Cumulative
0	24	24.7 %	24.7 %
1	2	2.1 %	26.8 %
2	5	5.2 %	32.0 %
3	2	2.1 %	34.0 %
4	6	6.2 %	40.2 %
5	2	2.1 %	42.3 %
6	11	11.3 %	53.6 %
7	27	27.8 %	81.4 %
8	12	12.4 %	93.8 %
9	6	6.2 %	100.0 %
	---	---	---
Total	97	100.0 %	100.0 %

Minimum = 0

Maximum = 9

Mean = 4.7

Median = 6

Mode = 7

Standard deviation = 3.2

Standard error of the mean = 0.33

99 % confidence interval around the mean = 3.87 - 5.56

Skewness = -0.46

Kurtosis = 1.6

Kolmogorov-Smirnov statistic for normality = 2.3

A.1.3 Expressed Control

For expressed control, the mean and the mode of the distribution of scores are not close and there is some positive skewness. The distribution is rather platykurtic with the 99% confidence range of 2.4 to 3.8. Details are shown in Table A.1.3. The K-S test suggests that the distribution is most likely not normal, mainly due to the high frequency of zero scores. The U.S. national norm data for expressed control states that 50% of subjects were between 2 to 5 with a mean of 3.9.

Table A.1.3 Expressed Control Scores

EC	Number	Percent	Cumulative
0	21	21.6 %	21.6 %
1	15	15.5 %	37.1 %
2	11	11.3 %	48.5 %
3	11	11.3 %	59.8 %
4	9	9.3 %	69.1 %
5	10	10.3 %	79.4 %
6	9	9.3 %	88.7 %
7	4	4.1 %	92.8 %
9	7	7.2 %	100.0 %
	---	---	---
Total	97	100.0 %	100.0 %

Minimum = 0

Maximum = 9

Mean = 3.1

Median = 3

Mode = 0

Standard deviation = 2.7

Standard error of the mean = 0.28

99 % confidence interval around the mean = 2.4 - 3.8

Skewness = 0.63

Kurtosis = 2.4

Kolmogorov-Smirnov statistic for normality = 1.5

A.1.4 Wanted Control

For wanted control, the mean and the mode of the distribution are not close and there is a significant positive skew. The distribution is close to mesokurtic with the 99% confidence range of 2.3 to 3.5. The details are shown in Table A.1.4. The K-S test suggests that the distribution is probably not normal, mainly due to three high frequency low scores. The U.S. national norm data for wanted control states that 50% of subjects were between 3 to 6 with a mean of 4.9. This sample, therefore, has a mean score for wanted control which is less than the US national norm.

Table A.1.4 Wanted Control Scores

WC	Number	Percent	Cumulative
0	6	6.2 %	6.2 %
1	27	27.8 %	34.0 %
2	20	20.6 %	54.6 %
3	17	17.5 %	72.2 %
4	8	8.2 %	80.4 %
5	4	4.1 %	84.5 %
6	3	3.1 %	87.6 %
7	6	6.2 %	93.8 %

8	4	4.1 %	97.9 %
9	2	2.1 %	100.0 %
	---	-------	-------
Total	97	100.0 %	100.0 %

Minimum = 0

Maximum = 9

Mean = 2.9

Median = 2

Mode = 1

Standard deviation = 2.3

Standard error of the mean = 0.23

99 % confidence interval around the mean = 2.29 - 3.48

Skewness = 1.07

Kurtosis = 3.26

Kolmogorov-Smirnov statistic for normality = 2.0

A.1.5 Expressed Affection

For expressed affection, the mean and the mode of the distribution of scores are close and there is positive skewness. The distribution is slightly leptokurtic with the 99% confidence range of 2.6 to 3.6. Details are shown in table A.1.5. The K-S test suggests that the distribution is probably not normal. The U.S. national norm data for expressed affection states that 50% of subjects were between 3 to 6 with a mean of 4.1. Once again the mean score was less than the US national norm.

Table A.1.5 Expressed Affection Scores

EA	Number	Percent	Cumulative
0	2	2.1 %	2.1 %

1	19	19.6 %	21.6 %
2	11	11.3 %	33.0 %
3	37	38.1 %	71.1 %
4	9	9.3 %	80.4 %
5	12	12.4 %	92.8 %
7	1	1.0 %	93.8 %
8	6	6.2 %	100.0 %
	---	---	---
Total	97	100.0 %	100.0 %

Minimum = 0

Maximum = 8

Mean = 3.1

Median = 3

Mode = 3

Standard deviation = 1.8

Standard error of the mean = 0.19

99 % confidence interval around the mean = 2.6 - 3.6

Skewness = 0.97

Kurtosis = 3.97

Kolmogorov-Smirnov statistic for normality = 2.36

A.1.6 Wanted affection

For wanted affection, the mean and the mode of the distribution of the scores are not close and there is some negative skewness. The distribution is mesokurtic with the 99% confidence range of 4.1 to 5.3. Details are shown in Table A.1.6. The K-S test suggests that the distribution is probably not normal. The U.S. national norm data for wanted affection states that 50% of subjects were between 3 to 6 with a mean of 4.8. In this case, the mean for the sample was close to was still less than the US

national norm.

Table A.1.6 Wanted affection Score

WA	Number	Percent	Cumulative
0	6	6.2 %	6.2 %
1	7	7.2 %	13.4 %
2	3	3.1 %	16.5 %
3	7	7.2 %	23.7 %
4	6	6.2 %	29.9 %
5	40	41.2 %	71.1 %
6	12	12.4 %	83.5 %
7	7	7.2 %	90.7 %
8	4	4.1 %	94.8 %
9	5	5.2 %	100.0 %
	---	---	---
Total	97	100.0 %	100.0 %

Minimum = 0

Maximum = 9

Mean = 4.7

Median = 5

Mode = 5

Standard deviation = 2.2

Standard error of the mean = 0.2247

99 % confidence interval around the mean = 4.1 - 5.3

Skewness = -0.4

Kurtosis = 3.0

Kolmogorov-Smirnov statistic for normality = 2.5

A.1.7 INTERCORRELATIONS

Table 1.7a shows the inter-correlation coefficients from the FIRO-B individual scores. Table 1.7b shows the correlations calculated by Schutz [1966]. These correlations and the differences between them are discussed in Chapter 7.

Table A.1.7a Intercorrelations

		EI	WI	EC	WC	EA
WI	r	0.70				
	p	0.00				
EC	r	0.05	0.04			
	p	0.79	0.82			
WC	r	0.34	0.41	0.14		
	p	0.07	0.03	0.46		
EA	r	0.35	0.50	-0.17	0.24	
	p	0.70	0.01	0.38	0.20	
WA	r	0.30	0.40	-0.29	0.08	0.61
	p	0.11	0.03	0.13	0.69	0.00

Table A.1.7b Schutz's Results

	EI	WI	EC	WC	EA
WI	.62				
EC	.15	.10			
WC	.12	.13	.25		
EA	.46	.49	.17	-.02	
WA	.31	.48	.00	-.15	.70

A.2 GROUP SCORES

In this section the individual subject scores were accumulated into group totals. The

ninety-seven subjects made up twenty-nine groups: two with one member; two with two members; seven with three members and eighteen with four members. Groups of less than four were proportionately scaled up so an inter group comparison could be made. The possible range is 0 to 36. There are no US national norms for group scores.

A.2.1 Group Expressed Inclusion

The distribution of the group scores for expressed inclusion is summarised in Table A.2.1. The distribution has a reasonable range, with the mean and the mode very close, and some negative skewness. The distribution is a little platykurtic but the K-S test indicates a close approximation to a normal curve.

Table A.2.1 Group Expressed Inclusion Scores

Minimum	= 6.7
Maximum	= 25.3
Mean	= 16.1
Median	= 16
Mode	= 16
Standard deviation	= 4.5
Standard error of the mean	= 0.85
99% confidence interval	= 13.9 - 18.3
Skewness	= -0.19
Kurtosis	= 2.5
Kolmogorov-Smirnov statistic for normality	= 0.53

A.2.2 Group Wanted Inclusion.

The distribution of the group scores for wanted inclusion is summarised in Table A.2.2. The distribution has the largest possible range, a mean and a median which are very close and two modes. There is some negative skewness. The distribution is a

little platykurtic but the K-S test indicates a close approximation to a normal curve.

Table A.2.2 Group Wanted Inclusion Scores

Minimum = 0

Maximum = 36

Mean = 19.8

Median = 20

Modes (Bimodal) = 24 & 28

Standard deviation = 8.8

Standard error of the mean = 1.67

99 % confidence interval around the mean = 15.5 - 24.1

Skewness = -0.23

Kurtosis = 2.47

Kolmogorov-Smirnov statistic for normality = 0.56

A.2.3 Group Expressed Control.

The distribution of the group scores for expressed control is summarised in Table A.2.3. It has a good range, with a close mean, mode and median and some positive skewness. The distribution is nearly mesokurtic but the K-S test indicates a close approximation to a normal curve.

Table A.2.3 Group Expressed Control Scores

Minimum = 0

Maximum = 26.7

Mean = 13.6

Median = 12

Mode = 12

Standard deviation = 6.1

Standard error of the mean = 1.15

99 % confidence interval around the mean = 10.6 - 16.5

Skewness = 0.2

Kurtosis = 2.8

Kolmogorov-Smirnov statistic for normality = 0.85

A.2.4 Group Wanted Control.

The distribution of the group scores for wanted control is summarised in Table A.2.4. The distribution has a reasonable range. The mean and the median are close but the mode is quite separate. There is positive skewness. The distribution is nearly mesokurtic but the K-S test indicates a close approximation to a normal curve.

Table A.2.4 Group Wanted Control Score

Minimum = 5

Maximum = 28

Mean = 12.9

Median = 12

Mode = 5

Standard deviation = 6.1

Standard error of the mean = 1.16

99 % confidence interval around the mean = 9.9 - 15.9

Standard deviation (unbiased) = 6.2

Skewness = 0.88

Kurtosis = 3.15

Kolmogorov-Smirnov statistic for normality = 0.69

A.2.5 Group Expressed Affection.

The distribution of the group scores for expressed affection is summarised in Table A.2.5. It has a reasonable range, a close mean and median and is bi-modal. There is

some positive skewness. The distribution is platykurtic and the K-S test indicates a weak approximation to a normal curve.

Table A.2.5 Group Expressed Affection

Minimum = 8

Maximum = 22.7

Mean = 13.0

Median = 12

Modes (Bimodal) = 8 & 12

Standard deviation = 4.5

Standard error of the mean = 0.85

99 % confidence interval around the mean = 10.8 - 15.2

Skewness = 0.83

Kurtosis = 2.45

Kolmogorov-Smirnov statistic for normality = 1.15

A.2.6 Group Wanted Affection.

The distribution of the group scores for wanted affection is summarised in Table A.2.6. It has a reasonable range, a close mean, mode and median. There is some negative skewness. The distribution is almost mesokurtic but the K-S test indicates an approximation to a normal curve.

Table A.2.6 Group Wanted Affection Score

Minimum = 4

Maximum = 28

Mean = 18.9

Median = 20

Mode = 20

Standard deviation = 6.1

Standard error of the mean = 1.15

99% confidence interval around the mean = 16.0 - 21.9

Skewness = -0.79

Kurtosis = 3.1

Kolmogorov-Smirnov statistic for normality = 0.86

A.3 FORECAST ERROR

Performance was measured by forecast accuracy. Before calculating the correlations between total group scores and performance some descriptive statistics on the performance measure are provided.

The range of the forecast error is from 0% to 30%.

A.3.1 Period 1

The distribution of the forecast errors in the first period is summarised in Table A.3.1. It shows very little skewness, the range is wide and the mean and the median are fairly close. It is a little leptokurtic but the K-S test suggests that the distribution is only a rough approximation to a normal curve.

Table A.3.1 Period 1 Errors

Minimum = 1%

Maximum = 30%

Mean = 11.59%

Median = 10.34%

Standard deviation = 6.4%

Standard error of the mean = 1.2%

99 % confidence interval around the mean = 8.5% - 14.7%

Skewness = 0.09

Kurtosis = 3.68

Kolmogorov-Smirnov statistic for normality = 1.09

A.3.2 Period 2

The distribution of the forecast errors in the second period is summarised in Table A.3.2. It shows positive skewness and the range is wide and the mean and median are fairly close. It is very leptokurtic but the K-S test suggests that the distribution roughly approximates a normal curve.

Table A.3.2 Period 2 Errors

Minimum = 2.6%

Maximum = 30.0%

Mean = 10.4%

Median = 9.6%

Standard deviation = 5.2%

Standard error of the mean = .1%

99 % confidence interval around the mean = 7.85% - 12.92%

Skewness = 1.79

Kurtosis = 7.58

Kolmogorov-Smirnov statistic for normality = 1.02

A.3.3 Period 3

The distribution of the forecast errors in the last period is summarised in Table A.3.3. It shows little skewness but the range is narrower than in earlier periods with the mean and median being close. It is a little platykurtic but the K-S test suggests the distribution is approximated to a normal curve.

Table A.3.3 Period 3 Errors

Minimum = 1.9%

Maximum = 17.1%

Mean = 8.86%

Median = 9.65%

Standard deviation = 3.5%

Standard error of the mean = 0.7%

99 % confidence interval around the mean = 7.17% - 10.55%

Skewness = 0.04

Kurtosis = 2.48

Kolmogorov-Smirnov statistic for normality = 0.59

A.4 GROUP SCORES AGAINST PERFORMANCE

Having the group scores and a measure of performance (forecast error) the first two hypotheses can now be tested. These hypotheses concern group total score on inclusion and control. The association between performance and total wanted inclusion score tests whether groups consisting of persons who like to work in groups (high wanted inclusion scores) perform better than those who do not like to work in groups (low total wanted inclusion scores). It was expected that groups with high total inclusion scores would perform better[2].

As the direction of the association seems to be obvious a regression rather than a correlation test was used. Hewett et.al. [1974], among others, suggested that there would be a non-linear relationships between performance and total group scores. A parabolic function was, therefore, used to test this suggestion.

Hypothesis 3 The third hypothesis was formally stated as

2. To indicate any potential bias the expectations of the researcher are stated regardless of the null form of the hypothesis

follows:[3]

Ho. That there is no association between a group's total score on inclusion and its forecast accuracy.

A.4.1 Total Wanted Inclusion and Forecast Error

Table A.4.1a summarises the results of a stepwise linear regression test between the total wanted inclusion score and the forecast error. The table only shows the results from the second period. As the results for the other two periods are virtually identical, they are not shown. Total Wanted Inclusion scores were squared and then used as the second variable. This was done to provide the squared function for the parabolic form: $ax + bx^2 + c$, where x = total wanted inclusion.

Table A.4.1a Stepwise Regression Summary

Step No.	Variable Entered		Increase in Rsq
1	Total Wanted Inclusion (TWI)		0.21
2	Total Wanted Inclusion Squared(TWI^2)		0.12
		Total Rsq	0.33

Regression Statistics

Coefficient of multiple determination = 0.33

Coefficient of multiple correlation = 0.57

Standard error of multiple estimate = 0.05

F-Ratio = 6.35

3. The hypotheses are presented in the order that the results are calculated.

Degrees of freedom = 2 & 26

Probability of chance = 0.006

Regression coefficients

Constant = 0.2110

Var.	Coeff.	Beta	F-ratio	Prob.	Std.Error
TWI	-0.0101	-1.7059	8.1562	0.0083	0.0035
TWI^2	0.0002	1.3006	4.7412	0.0387	0.0001

Correlation Coefficients

	Error P2	TWI
TWI	I -.4533	
TWI^2	I -.3423	0.9631

There is a significant correlation between total wanted inclusion needs and performance. Table A.4.1a shows that the strength of the relationship is significantly improved with the use of the non-linear model. This result suggests that groups made up of members that like to be in groups out-perform those that do not like to be in groups. However, the relationship is not linear. Groups with a little incompatibility appear to perform best.

The hypothesis can be further tested by considering whether groups with high total wanted inclusion scores improve their performance from period to period more than groups with low total wanted inclusion scores. Relative improvement in performance is measured by taking the difference between the forecast error in the first period and the third period.

The result of the test of the relationship between total wanted inclusion score and the improvement in performance are summarised in Table A.4.1b

Table A.4.1b. Total Wanted Inclusion Score and Performance Improvement

	Forecast Error
	P3 - P1
Wanted Incl.	r = 0.32
	p = 0.07

While it is not significant at the 5% level, there is a weak positive correlation between relative improvement and total wanted inclusion scores.

The null hypothesis that there is no association between total wanted inclusion scores and performance cannot be accepted on the basis of these tests. A non-linear relationship was found between performance and members orientation to working in small groups. It is concluded, however, that, generally, small groups composed of members who like working in groups perform better than small groups composed of members who do not like working in groups. This result is not couner-intuitive. The problems of generalising this finding have been alluded to earlier in this study.

A.4.2 Total Control Scores and Performance

It has been suggested that expressed control needs have an association with high, and effective, competitive drive. Groups with a high total expressed control score may, therefore, be highly motivated and perform better. As there has been no suggestion of a non-linear relationship the expressed total control scores were correlated against forecast error. It was expected that groups with high total expressed control scores would not outperform other groups.

Hypothesis 4. This hypothesis which was tested has been formally

stated as follows:

Ho. That there is no association between a group's total score on expressed control and its forecast accuracy.

Table A.4.2 Total Group Control Score and Forecast Error.

			F1	F2	F3
EC	r	I	-0.2159	-0.2186	-0.3282
	p	I	0.2606	0.2546	0.0821
WC	r	I	-0.2698	-0.2045	-0.0753
	p	I	0.1570	0.2872	0.6978

No significant correlations were found between groups' total control scores and forecast error for any of the three periods. The hypothesis of no association between total control scores and performance is, therefore, confirmed. The generality of this confirmation, has already been discussed.

A.5 SELF-SELECTION AND COMPATIBILITY

This study allowed group members to self-select to test whether incompatible groups would form. The formal hypothesis tested in this section is as follows.

Hypothesis 1a

Ho. If group members are allowed to self-select then they will not form interpersonal compatible groups.

Interpersonal compatibility scores were calculated for each of the three types of

compatibility (originator, interchange, and reciprocal). This calculation could not use the formulae suggested by Schutz [1966] as he was concerned with dyad relationships. A variety of methods has been used to calculate group compatibility scores. Hewett et.al. [1974] took the range of the groups' scores. Hill [1975] used the mean of the difference between all the dyads in the group. Neither of these methods appears to provide logical or consistent measures of incompatibility. The approach taken in this study is to treat the group member with the highest score as one member of a dyad and the average of the remaining members of the group as the other part of the dyad. This allows the group to be measured as a whole in a way simple pairing cannot capture. Many of the inconsistencies of the other methods are eliminated. The equation for reciprocal compatibility[4] was:

Reciprocal Compatibility =

$$| \max(e's\ e) - \text{avg } w | + | \text{avg } e - \max(e's\ w) | \quad \text{.....(1)}$$

That is, the difference between the group's maximum expressed score (max(e's e)) and the group's average wanted score (avg w) was calculated. This was added to the difference between the group's average expressed score (avg e) and the highest expressed score's wanted score (max(e's w)).

The equation for originator compatibility was:

$$\text{Originator Compatibility} = [(\max(e's\ e) - \max(e's\ w)] + (\text{avg } e - \text{avg } w) \quad \text{.....(2)}$$

The equation for interchange compatibility was:

$$\text{Interchange Compatibility} = \Sigma(\sigma(e + w)) \quad \text{.....(3)}$$

---

4. The types of compatibility were defined earlier.

Schutz suggested that the goal setter should be included in the calculation of group scores of compatibility. Even if the most extreme scores are used to represent this non-group member, there is very little impact on the group's compatibility score. Given the statistical tests used and the strength of the association it was found that little was gained by including such calculations and it was decided not to include the goal setter.

The statistics in the A.5 Tables describe the different compatibility scores for the groups. Whetten and Cammeron [1984] used a score of 6 or below to separate compatible and incompatible groups. Given the possible range of 0 to 18, six appears to be a low cutting point. However, if this score is used to distinguish compatible from incompatible, and it was expected that groups will form to avoid incompatibility, then the majority of groups would have compatibility scores of less than 6. A more useful statistic may be the range and the degree of normality exhibited in the data. Normality is required if the data is to be used in correlation tests.

A.5.1 Reciprocal Compatibility on Inclusion (RCI).

The possible range is 0 to 18.

The distribution of this particular compatibility score is summarised in Table A.5.1. It shows little skewness but the range is limited with the mean, mode and median being fairly close. The distribution is a little platykurtic but the K-S test suggests the distribution approximates a normal curve.

Table A.5.1 Reciprocal Compatibility on Inclusion (RCI).

Minimum	= 0.5
Maximum	= 7.5
Mean	= 4.3
Median	= 4

Mode = 4

Standard deviation = 1.9

Standard error of the mean = 0.37

99% confidence interval around the mean = 3.36 - 5.28

Skewness = -0.07

Kurtosis = 2.27

Kolmogorov-Smirnov statistic for normality = 0.49

A.5.2 Reciprocal Compatibility for Control.

The possible range is 0 to 18.

The distribution of this compatibility score is summarised in Table A.5.2. It shows little skewness, the range is limited, the mean and the median are fairly close, but the mode is higher. It is platykurtic but the K-S test suggests that the distribution approximates a normal curve.

Table A.5.2 Reciprocal Compatibility for Control.

Minimum = 1

Maximum = 11.75

Mean = 6.25

Median = 6

Mode = 9

Standard error of the mean = 0.58

99% confidence interval around the mean = 4.8 - 7.7

Skewness = 0.14

Kurtosis = 1.96

Kolmogorov-Smirnov statistic for normality = 0.65

A.5.3 Reciprocal Compatibility for Affection.

The possible range is 0 to 18.

The distribution of this compatibility score is summarised in Table A.5.3. It shows very little skewness but the range is limited with the mean, mode and median being fairly close. It is platykurtic but the K-S test suggests that the distribution approximates a normal curve.

Table A.5.3 Reciprocal Compatibility for Affection.

Minimum	= 1
Maximum	= 7.5
Mean	= 4.2
Median	= 4.25
Modes (Bimodal)	= 4.25 & 5
Standard deviation	= 1.76
Standard error of the mean	= 0.34
99% confidence interval around the mean	= 3.32 - 5.09
Skewness	= 0.04
Kurtosis	= 1.99
Kolmogorov-Smirnov statistic for normality	= 0.7

A.5.4 Originator Compatibility for Inclusion.

The possible range is -18 to +18.

The distribution of this compatibility score is summarised in Table A.5.4. It shows a little positive skewness but the range is limited and the mean and the median are close. The distribution is leptokurtic but the K-S test suggests that it approximates

a normal curve. Only three groups had scores of greater than 6 which was mentioned by Whetten and Cammeron as the critical score for classifying groups as compatibility or incompatible.

Table A.5.4 Originator Compatibility for Inclusion.

Minimum = -8

Maximum = 7.3

Mean = -2.1

Median = -2.75

Mode = Multi-Modal

Standard deviation = 3.3

Standard error of the mean = 0.65

99% confidence interval around the mean = -3.7 to -0.38

Skewness = 1.05

Kurtosis = 4.35

Kolmogorov-Smirnov statistic for normality = 0.93

A.5.5 Originator Compatibility for Control.

The possible range is -18 to +18.

The distribution of this particular compatibility score is summarised in Table A.5.5. It shows a little negative skewness, the range is slightly limited and the mean and the median are reasonably close. It is nearly mesokurtic and the K-S test suggests that the distribution approximates a normal curve.

Table A.5.5 Originator Compatibility for Control.

Minimum = -11

Maximum = 11.75

Mean = 3.59

Median = 4

Mode = 5.25

Standard deviation = 5.21

Standard error of the mean = 1.02

99% confidence interval around the mean = 0.96 - 6.2

Skewness = -0.8

Kurtosis = 3.4

Kolmogorov-Smirnov statistic for normality = 0.75

A.5.6 Originator Compatibility for Affection.

The possible range is -18 to +18.

The distribution of this particular compatibility score is summarised in Table A.%.6. It shows some negative skewness but the range is limited with the mean and the median being reasonably close. It is platykurtic and the K-S test suggests that the distribution roughly approximates a normal curve.

Table A.5.6 Originator Compatibility for Affection.

Minimum = -7

Maximum = 1

Mean = -2.9

Median = -2.5

Mode = Multi-Modal

Standard deviation = 2.02

Standard error of the mean = 0.4

99% confidence interval around the mean = -3.9 to -1.89

Skewness = -0.5

Kurtosis = 2.55

Kolmogorov-Smirnov statistic for normality = 0.999

A.5.7 Interchange Compatibility for Inclusion.

The possible range is 0 to 18

The distribution of this particular compatibility score is summarised in Table A.5.7. It shows a little positive skewness but the range is limited and the mean and the median are close. The distribution is platykurtic and the K-S test suggests that the distribution approximates a normal curve.

Table A.5.7 Interchange Compatibility for Inclusion.

Minimum = 0.94

Maximum = 7

Mean = 3.46

Median = 3.77

Mode = 6

Standard deviation = 1.58

Standard error of the mean = 0.31

99%t confidence interval around the mean = 2.7 - 4.26

Skewness = 0.18

Kurtosis = 2.38

Kolmogorov-Smirnov statistic for normality = 0.5

A.5.8 Interchange Compatibility for Control.

The possible range is 0 to 18

The distribution of this particular compatibility score is summarised in Table A.5.8. It shows positive skewness. The range is limited with the mean and the median being fairly close. The distribution is highly leptokurtic and the K-S test suggests that it only very approximately represents a normal curve.

Table A.5.8 Interchange Compatibility for Control.

Minimum = 1.25

Maximum = 9

Mean = 3.05

Median = 2.38

Mode = Multi-Modal

Standard deviation = 1.92

Standard error of the mean = 0.38

99% confidence interval around the mean = 2.1 - 4.0

Skewness = 2.11

Kurtosis = 7.03

Kolmogorov-Smirnov statistic for normality = 1.14

A.5.9 Interchange Compatibility for Affection.

The possible range is 0 to 18

The distribution of this particular compatibility score is summarised in Table A.5.9. It shows a little positive skewness, the range is limited and the mean and the median are close. It is platykurtic and the K-S test suggests the distribution approximates a normal curve.

Table A.5.9 Interchange Compatibility for Affection.

Minimum = 1

Maximum = 5.02

Mean = 2.66

Median = 2.74

Mode = Multi-Modal

Standard deviation = 1.2

Standard error of the mean = 0.24

99% confidence interval around the mean = 2.0 - 3.3

Skewness = 0.23

Kurtosis = 2.2

Kolmogorov-Smirnov statistic for normality = 0.89

It would appear, therefore, that given self-selection, compatible groups form. This conclusion raises the question of the usefulness of compatibility theory for predicting work group performance when there is a high degree of self-selection. However, the range was large enough and the distribution close enough to normal to test if performance was correlated to compatibility.

A.6 COMPATIBILITY AND ERROR

It is now possible to test for an association between compatibility and forecast error scores. The formal hypothesis which is tested is as follows:

Hypothesis 5

Ho. That there is no asociation between a group's interpersonal compatibility and its performance.

This hypothesis was tested using Pearson correlations on the nine compatibility scores against the three forecast error scores. The results are summarised in Table A.6.1.

Table A.6.1C Compatibility Against Performance

		RCI	RCC	RCA	OCI	OCC	OCA	ICI	ICC	ICA	F1	F2
RCC	r	-0.00										
	p	0.99										
RCA	r	0.07	-0.07									
	p	0.73	0.72									
OCI	r	-0.11	-0.29	0.22								
	p	0.60	0.14	0.27								
OCC	r	-0.19	0.25	-0.07	0.31							
	p	0.34	0.21	0.73	0.12							
OCA	r	0.23	0.05	-0.54	0.05	0.05						
	p	0.25	0.82	0.00	0.81	0.81						
ICI	r	0.34	0.32	0.26	-0.33	-0.18	-0.01					
	p	0.09	0.10	0.20	0.09	0.37	0.94					
ICC	r	0.07	0.42	-0.13	-0.21	-0.39	0.27	0.36				
	p	0.75	0.03	0.52	0.29	0.05	0.18	0.07				
ICA	r	0.09	-0.13	0.56	0.36	-0.02	0.17	0.20	0.00			
	p	0.68	0.51	0.00	0.06	0.90	0.41	0.32	0.98			
F1	r	0.24	-0.07	0.21	0.47	-0.05	0.29	0.05	0.20	0.33		
	p	0.23	0.72	0.30	0.01	0.80	0.14	0.81	0.33	0.09		
F2	r	0.33	-0.26	0.20	0.55	-0.11	0.16	-0.06	0.04	0.19	0.87	
	p	0.10	0.20	0.31	0.00	0.60	0.41	0.76	0.85	0.35	0.00	
F3	r	0.25	-0.26	-0.02	0.40	-0.22	0.25	-0.11	0.03	0.14	0.75	0.83
	p	0.20	0.19	0.93	0.04	0.28	0.20	0.59	0.88	0.49	0.00	0.00

Originator Compatibility on Inclusion (OCI) is significantly correlated to forecast error. This measure of compatibility was designed so that both a large positive and a large negative score represented incompatibility. It is, therefore, necessary to test for a non-linear relationship. The parabolic form is used and the results are summarised in Table A.6.2.

Table A.6.2 Parabolic Regression

Step No.	Variable Entered	Multiple RSQ
1	OCI^2	0.36
2	OCI	0.13
	TOTAL	0.50

Coefficient of multiple determination = 0.4923

Coefficient of multiple correlation = 0.7016

Standard error of multiple estimate = 0.0405

F-Ratio = 11.64

Degrees of freedom = 2 & 24

Probability of chance = 0.0003

Constant = -0.47

Var.	Coeff.	Beta	F-ratio	Prob.	Std.Error
OCI	-0.05	-2.92	6.29	0.019	0.02
OCI^2	0.001	3.49	9.02	0.006	0.001

There appears to be a significant association between group OCI and performance. The non-linear form shows a stronger relationship than the simple linear regression model.

The hypothesis can be further tested by considering the relationship between OCI and improvement in performance over the three periods. The results are summarised in Table A.6.3.

To test the relative improvement in performance for originator compatibility the compatibility score was correlated against the change in forecast error over the three

periods. A change would indicate a relationship between compatibility and relative improvement.

Table A.6.3 OCI against Performance Improvement

	P3 Error - P1 Error
OCI	r =-0.38
	p = 0.05

This result supports the argument that originator compatibility results in a relatively improved performance.

A.7 FEEDBACK

The literature review suggested that negative feedback would, depending on the degree of compatibility, induce stress and influence a group's performance. Incompatible groups would be expected to waste more time on incompatibilities and reduce their performance. Negative feedback to compatible groups was expected to reduce any over confidence (optimism) and improve performance.

The formal hypothesis which is tested is as follows:

Hypothesis 8

> *Ho. That any association between compatibility and forecast accuracy will not be increased by feedback.*

The feedback hypothesis was tested by comparing the differences between the three period end correlations. It was assumed that the performance of incompatible groups would not improve as much as that for compatible groups and that the correlation between compatibility and performance would strengthen over the three periods. Fisher's "r" to "z" formula [Wright and Fowler,1989,p.101] was used to test the differences between the correlation coefficients. The first period error was assumed

to be the "no feedback" test. It was expected that significant differences would be found.

Z scores were calculated using the ratio:

$$z = \frac{z_{r1} - z_{r2}}{(1/(N_1-3) + 1/(N_2-3))^{1/2}}$$

If the ratio is greater than or equal to 1.96, the correlations are significantly different at the 5 per cent level [Fowler and Wright,1989,p.101]

OCI correlations over the three periods was as follows:

$Z_{p1} = 0.51$	$Z_{p2} = 0.61$	$Z_{p1} = 0.51$
$Z_{p2} = 0.61$	$Z_{p3} = 0.42$	$Z_{p3} = 0.42$
$Z_{1,2} = -0.35$	$Z_{2,3} = 0.66$	$Z_{1,3} = 0.31$

As OCI was the only significant variable it was the only one tested. There were no significant changes in correlations over the different periods so the hypothesis cannot be rejected.

Summary

The students' individual interpersonal scores were narrow in range. The groups' total on wanted inclusion needs (a measure of desire to work in groups) was correlated with performance in a non-linear manner. It would appear that groups that were slightly incompatible outperformed other groups. This result is consistent with earlier work [Hall,1963]. The groups' total wanted control scores (a possible measure of motivation) were not correlated with performance.

When formed into groups the compatibility scores were generally normally distributed as could be expected with an averaging process. Only originator compatibility on inclusion (OCI) was found to be correlated with performance. This result was confirmed by the total score on inclusion, by the correlation between OCI and by the the relative improvement in performance. It was enhanced by the use of a non-linear form. No evidence was found that feedback was more increased the impact of compatibility on performance.

This section has suggested that OCI in a non-linear form should be used in a general performance model.

B. COGNITIVE STYLES

This section presents the descriptive statistics from the ninety-seven individual cognitive styles scores. They are followed by the group total scores and the group compatibility scores which are first used to illustrate the result of self- selection. The compatibility scores are then correlated with the forecast error and the impact of feedback is also tested.

Contents

B.1 INDIVIDUAL STYLES SCORES

This study uses the Keen instrument to test individual cognitive styles scores. A low score on the preceptive scale indicates a high receptive style and a low score on the systematic scale indicates a high intuitive style. Keen expected that the distribution of styles would be bi-modal because subjects would have a tendency

towards one extreme or the other.

B.1.1 Gathering Information - Preceptive

The possible range of scores is from 0 to 12.

The distribution of the scores for gathering style scores is summarised in Table B.1.1. It has a good range, with the mean and mode being close and with little negative skewness. The distribution is nearly mesokurtic but the K-S test indicates non normality, due mainly to the large number of "six" scores. The distribution is not bi-modal as was expected by Keen.

Table B.1.1 Gathering Information - Preceptive GI(p)

GI(p)	Number	Percent	Cumulative
2	2	2.1 %	2.1 %
3	3	3.1 %	5.2 %
4	9	9.4 %	14.6 %
5	12	12.5 %	27.1 %
6	24	25.0 %	52.1 %
7	15	15.6 %	67.7 %
8	18	18.8 %	86.5 %
9	8	8.3 %	94.8 %
10	3	3.1 %	97.9 %
11	2	2.1 %	100.0 %
	---	---	---
Total	96	100.0 %	100.0 %

Minimum = 2

Maximum = 11

Mean = 6.5

Median = 6

Mode = 6

Standard deviation = 1.88

Standard error of the mean = 0.19

99 % confidence interval around the mean = 6.0 - 7.0

Skewness = -0.03

Kurtosis = 2.82

Kolmogorov-Smirnov statistic for normality = 1.29

B.1.2 Evaluating Information - Systematic EI(s)

The possible range of scores for evaluating information is from 0 to 12.

The distribution of the EI(s) scores is summarised in Table B.1.2. The distribution has a wide range, with the mean and mode being fairly close and with a little negative skewness. The distribution is slightly platykurtic with the K-S test indicating approximate normality. There is little evidence of a bi-modal distribution.

Table B.1.2 Evaluating Information - Systematic

EI(s)	Number	Percent	Cumulative
1	3	3.1 %	3.1 %
2	2	2.1 %	5.2 %
3	6	6.3 %	11.5 %
4	7	7.3 %	18.8 %
5	17	17.7 %	36.5 %
6	15	15.6 %	52.1 %
7	14	14.6 %	66.7 %
8	13	13.5 %	80.2 %
9	10	10.4 %	90.6 %

10	7	7.3 %	97.9 %
11	2	2.1 %	100.0 %
	---	---	---
Total	96	100.0 %	100.0 %

Minimum = 1

Maximum = 11

Mean = 6.4

Median = 6

Mode = 5

Standard deviation = 2.3

Standard error of the mean = 0.24

99 % confidence interval around the mean = 5.77 - 6.98

Skewness = -0.2

Kurtosis = 2.6

Kolmogorov-Smirnov statistic for normality = 0.9

B.2 TOTAL GROUP STYLE

The individual scores were accumulated into group scores. The range of scores possible on the Keen instrument for groups is from 0 to 48.

B.2.1 Gathering Information - Preceptive

The distribution of the group scores for preceptive style is summarised in Table B.2.1. There is a reasonable range, with the mean, mode and median being fairly close. There is some negative skewness. The distribution is a little platykurtic with the K-S test indicating an approximate normal curve. The narrow range within the 99% confidence limits suggests that groups with an extreme preceptive style are unusual.

Table B.2.1 Gathering Information - Preceptive

Minimum = 17

Maximum = 37.3

Mean = 27.37

Median = 28

Mode = 32

Standard deviation = 4.9

Standard error of the mean = 0.93

99 % confidence interval around the mean = 24.98 - 29.76

Skewness = -0.22

Kurtosis = 2.35

Kolmogorov-Smirnov statistic for normality = 0.57

B.2.2 Evaluation of Information - Systematic

The distribution of the group scores for systematic style is summarised in Table B.2.1. There is a reasonable range, with the mean, mode and median being fairly close. There is some positive skewness. The distribution is rather leptokurtic with the K-S test indicating some approximation to a normal curve. The range within the 99% confidence limits suggests that groups with an extreme intuitive style are unusual.

Table B.2.2 Evaluation of Information - Systematic

Minimum = 16

Maximum = 46.7

Mean = 26.8

Median = 26

Mode = 28

Standard deviation = 6.17

99 % confidence interval around the mean = 23.8 - 29.8

Skewness = 1.17

Kurtosis = 4.83

Kolmogorov-Smirnov statistic for normality = 1.0

B.3 COGNITIVE STYLE AND PERFORMANCE

Hypothesis 6b concerns the advantages of a group having a strength in a certain cognitive style. If one style is correlated with the forecast error then this would be evidence against the argument that a range of styles should be present in a group for optimal performance. The researcher's bias was that no relationship between style and performance would be found. The formal hypothesis was as follows:

Hypothesis 6b

Ho.That there is no association between a group's total score on any particular cognitive style and its forecast accuracy.

This hypothesis was tested by correlating the total cognitive styles scores against forecast error. The results are summarised in Table B.3.1.

Table B.3.1 Group Total Cognitive Style

		F1	F2	F3	GI(p)
GI(p)	r	-0.4259	-0.3547	-0.3339	
	p	0.0212	0.0590	0.0767	
EI(s)	r	-0.2276	-0.1607	-0.2511	0.2273
	p	0.2350	0.4049	0.1889	0.2356

A high receptive score (-ve GI(p)) is significantly correlated to performance. The

strength of the correlations do, however, appear to be declining. The hypothesis is rejected. The significant of this result will be discussed in the Discussion section.

Hypothesis 6c was concerned with the association between the highest score of any one member of the group and performance. The formal hypothesis is as follows:

Hypothesis 6c

Ho: That there is no association between a group's highest score on any one particular cognitive style and its forecast accuracy

The results of this test are summarised in Table B.3.2.

Table B.3.2 Maximum Cognitive Style Score and Performance

		GI max	EI max
EImax	r	I 0.15	
	p	I 0.44	
F1	r	I -0.21	-0.16
	p	I 0.28	0.39
F2	r	I -0.21	-0.14
	p	I 0.28	0.48
F3	r	I -0.10	-0.15
	p	I 0.61	0.42

It is concluded that the maximum cognitive style score from each group was not correlated to performance. Hypothesis 6c is, therefore, not rejected.

B.4 FEEDBACK

Feedback may reassure those using the "appropriate" cognitive style and induce changes in those groups using the "wrong" style. Therefore, feedback would be expected to reduce differences in performance which are due to cognitive style.

B.4.1 Change in Correlations

The formal hypothesis tested is as follows:

Hypothesis 8

> *Ho: That any association between compatibility and forecast accuracy will not increase with feedback, regardless of the group's previous experience or ability*

The cognitive style aspects of this hypothesis was tested by looking for significant differences between the three period end correlations of total cognitive style and performance. Fisher's "r" to "z" formula [Fowler and Wright,1989,p.101] was used to test the significance of the differences between the correlation coefficients. The first period error was assumed to be the "no feedback" test[6].

Z scores were calculated using the ratio:

$$z = \frac{z_{r1} - z_{r2}}{(1/(N_1-3) + 1/(N_2-3))^{1/2}}$$

If the ratio is greater than or equal to 1.96 the correlations are significantly different at the 5 per cent level.

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6. The researchers bias was that that significant differences would not be found.

For GI(p) the scores are:

$Z_{p1} = 0.46$	$Z_{p2} = 0.38$	$Z_{p1} = 0.46$
$Z_{p2} = 0.38$	$Z_{p3} = 0.34$	$Z_{p3} = 0.34$
$Z_{1,2} = 0.28$	$Z_{2,3} = 0.14$	$Z_{1,3} = 0.42$

While the differences appear to be declining over the three periods they are not significant. The absence of any significant differences weakens the argument that any advantage from having a particular style is eroded by feedback. The null hypothesis cannot be rejected for cognitive style.

B.4.2 Difference in Forecast Error

An analysis of the change in error over the three periods would also assist in indicating whether feedback has caused a change in performance. The GI(p) scores were correlated against the difference in forecast error between the first and the last period. The results are summarised in Table B.4.2.

Table B.4.2 Gathering Information and Performance Change

	P3 Error - P1 Error
GI(p)	r = 0.35
	p = 0.07

This suggests that there has not been a significant relative reduction in performance over the three periods for this cognitive style. This result is discussed in Chapter6.

B.5 COGNITIVE COMPATIBILITY

The subjects were allowed to "self-select'. It was possible, therefore, to test whether the members recognised and allowed for cognitive compatibility. This leads to the cognitive compatibility hypothesis which was as follows:

Hypothesis 1b

Ho. If group members are allowed to self-select then they will not form groups of similar cognitive styles.

Cognitive incompatibility was calculated using diagonal opposites from Keen's quadrants. This sums the difference in the cognitive style scores for each dyad that makes up each group. The totals for each group for both the "gathering information" and "evaluating information" styles are calculated. A high score indicates a high degree of cognitive incompatibility. The distribution of these compatibility scores was examined particularly for range, using descriptive statistics.

B.5.1 Self-Selection for Compatibility[7]

The compatibility score has a possible range of 0 to 96. The distribution of group cognitive compatibility is summarised in Table B.5.1. It shows some positive skewness and a limited range. The mean and median are close. The distribution is platykurtic but the K-S test suggests the distribution approximates a normal curve. The mean score and the 99% confidence interval are low suggesting a low incompatibility as a result of self-selection.

Table B.5.1 Self-Selection for Compatibility

Minimum	= 4
Maximum	= 54
Mean	= 23.7
Median	= 23
Mode	= 16
Standard deviation	= 12.79
Standard error of the mean	= 2.5
99% confidence interval around the mean	= 17.3 - 30.2

7. The researcher bias was that compatible groups would form.

Skewness = 0.4

Kurtosis = 2.5

Kolmogorov-Smirnov statistic for normality = 0.63

B.5.2 Cognitive Compatibility and Performance

The next hypothesis tested is concerned with whether cognitive compatibility is related to performance. The formal hypothesis was a s follows:

Hypothesis 6a

Ho.That there is no association between a group's cognitive mix and its forecast accuracy.

This was tested by correlating compatibility against forecast error. The results are summarised in Table B.5.2.

Table B.5.2

Cognitive Compatibility Against Error

		F1	F2	F3
Cog.Comp	r I	-0.1131	-0.0592	0.1412
	p I	0.5745	0.7693	0.4824

It is concluded therefore that there was no significant correlation between compatibility and performance and that the null hypothesis could not be rejected.

C. ABILITY

Ability was measured using percentage grades obtained in a management accounting examination. The distribution of the individual scores is first presented. The students were classified into high, above average, below average, and low ability groups in order to study the impact of self-selection. Group compatibility scores are presented. The groups' total ability and forecast error are then correlated. The impact of feedback and the association between ability, interpersonal compatibility and cognitive style are also tested.

Contents

C.1 INDIVIDUAL SCORES

The distribution of the grades is summarised in Table C.1. It has a good range, with the mean and mode very close. There is some negative skewness. The distribution is nearly mesokurtic but the K-S test indicates a reasonable approximation to a normal curve.

Table C.1 Individual Scores

Minimum = 30

Maximum = 93

Mean = 65.6

Median = 65

Mode = 65

Standard deviation = 12.5

Standard error of the mean = 1.27

99 % confidence interval around the mean = 62.3 - 68.8

Skewness = -0.25

Kurtosis = 2.9

Kolmogorov-Smirnov statistic for normality = 0.7

C.2 GROUP MIX

The students were asked to self-select into groups. This leads to the first hypothesis about ability. The formal hypothesis is as follows:

Hypothesis 1c

Ho. That groups will not form in any consistent manner with regard to ability.

Statistical analysis of small group mix is not easy. The approach taken was to present the group data classified into four types for visual inspection. The standard deviations of the groups' ability scores were then summarised. Third an ANOVA was calculated treating each group as a separate sample.

C.2.1 Ability Mix: Standard Deviations

As a measure of ability mix the standard deviation of the member's ability in each group was calculated. The possible range was approximately 0 to 37.

The distribution of the standard deviations is summarised in Table C.2.2. It has a low mean and range within the 99% confidence limits thus demonstrating a a degree of compatibility (see table C.2.2). The distribution shows little skewness and a reasonable range with a close mean and median. It is platykurtic but the K-S test suggests that the distribution approximates a normal curve.

Table C.2.1 Ability Mix: Standard Deviations

Minimum = 2.06

Maximum = 16.01

Mean = 9.45

Median = 9.91

Mode = 6.4

Standard deviation = 3.66

Standard error of the mean = 0.72

99 Percent confidence interval = 7.6 - 11.3

Skewness = -0.09

Kurtosis = 2.07

Kolmogorov-Smirnov statistic for normality = 0.6

C.2.2 Ability mix: ANOVA Test

A third method for testing for ability mix was also used. This involved a one way randomised design ANOVA. This test measures a slightly different aspect from the two tests above. It is a measure of whether all the groups could come from the same population rather than whether the mix of their distributions is similar. It will therefore distinguish between a group containing, say, a mix of HHHL (H = high ability, L = low ability) from one containing a mix of LLLH. The results are summarised in Table C.2.2.

Table C.2.2 Ability mix: ANOVA Test

Source of Variation	DF	Sum of Squares	Mean Squares	F	Significance Level
A	26	5129	197	1.38	0.15
Error	68	9755	143		
Total	94	14884			

The "F" statistic suggests that the groups are not similar and did not come from the same population.

C.3 GROUP ABILITY AND PERFORMANCE

The relationship between ability and forecast error was tested in two ways. First, each group's total ability and its forecast error were correlated. Second, to test the Most Able theory, the group's maximum ability score was correlated to performance. The formal hypothesis is as follows:

Hypothesis 2.

Ho.That the ability mix of the group is not associated with forecast accuracy.

The results of the test are summarised in Table C.3a

Table C.3a GROUP ABILITY AND PERFORMANCE (

		P1	P2	P3	Group Max
Group	r	-0.04	-0.17	-0.19	
Max	p	0.83	0.41	0.35	
Group	r	-0.37	-0.38	-0.24	0.19
Total	p	0.06	0.05	0.23	0.34

It would therefore appear that there was initially a weak correlation between the groups' total ability and performance which disappeared by the third period. Despite the expectation that the more able groups would perform better, the correlation was not significant at the 5% level. The correlation is of sufficient size, however, to include ability in the later general regression model. There was also no significant correlation between groups' maximum ability score and forecast error. The hypothesis cannot therefore be rejected.

C.3b Standard Deviation Against Forecast Error

As a test of similarity theory the standard deviations of the groups ability scores were correlated with forecast error. the results are summarised in Table C.3b

Table C.3b Standard Deviation Against Forecast Error

Correlation matrix

		STD DEV of ABILITY
F1	r	0.14
	p	0.49
F2	r	0.13
	p	0.51
F3	r	-0.07
	p	0.73

There was no significant correlation between the ability dispersion of the groups and performance.

C.4 FEEDBACK

C.4.1 "Z" Score Test

As a test of the correlations between total ability and forecast error, over the three periods, the Z scores were calculated using the ratio:

$$z = \frac{z_{r1} - z_{r2}}{(1/(N_1-3) + 1/(N_2-3))^{1/2}}$$

For ability the "z" scores were:

$Z_{p1} = 0.37$	$Z_{p2} = 0.38$	$Z_{p1} = 0.37$
$Z_{p2} = 0.38$	$Z_{p3} = 0.24$	$Z_{p3} = 0.24$
$Z_{1,2} = 0.03$	$Z_{2,3} = 0.55$	$Z_{1,3} = 0.52$

As none of the ratios exceeds 1.96 it can be assumed that there were no significant changes in the correlations over the different periods. This suggests that feedback does not provide different levels of motivation to groups with different ability levels.

C.4.2 Difference-In-Error Test

As an alternative analysis, the correlations of the *change* in error against total ability for the three periods was calculated. The results are summarised in Table C.4.2.

Table C.4.2 Difference-In-Error Test

	P3 Error - P1 Error
Ability	r = 0.36
	p = 0.07

The correlation is not significant at the 5% level.

C.5 PARTICIPATION AND ABILITY

The correlation between group total ability and forecast error may also provide a test of whether working in groups can alter a person's performance. The limitations of this test will be considered in the Discussion chapter.

Hypothesis 2 will be further tested by measuring whether working in groups was of more benefit to low or high ability groups.

This test involved measuring the difference in rankings of groups for mean ability and forecast error. The change in ranking (performance change) was then correlated against the group ability scores. As inter-personal compatibility was thought to be a moderating variable on group performance this to was correlated against the change in performance. The results are summarised in Table C.5.

Table C.5 Participation and Ability

			Performance
		Ability	Change
Perf.	r	-0.550	
Change	p	0.003	
OCI	r	-0.530	0.05
	p	0.005	0.80

Ability is significantly correlated to Originator Compatibility and the change in performance. To exclude the impact of compatibility the partial correlation was calculated holding compatibility constant.

Using, 1 = performance change, 2 = OCI and 3 = ability, the correlation coefficient becomes: $r_{13.2} = -0.34$

It would therefore appear that lower ability members gain more from being in groups than high ability members.

C.6 Cognitive Style

Cognitive styles have been shown to be correlated to forecast error. The opportunity was taken to test whether cognitive style was also correlated to ability. The formal hypothesis was as follows:

Hypothesis 7b

Ho. That there is no association between ability and cognitive style.

The results are summarised in Table C.6.

Table C.6 Cognitive Style

		Gi(p)	EI(p)
EI(s)	r	0.2273	
	p	0.2356	
Ability	r	0.4754	0.1077
	p	0.0092	0.5780

Ability is significantly correlated to preceptive style (+GI) and the hypothesis is rejected.

D. OVERALL PERFORMANCE MODEL

This section draws together the associations found from previous tests into an overall regression model. The dependent variable is forecast error. The independent variables are, originator compatibility for inclusion (OCI), ability, cognitive style and cognitive compatibility. The direction of the association is, therefore, assumed to be that performance, measured by forecast error, is dependent upon the independent variables just listed.

Before the regression is calculated the presence of any multicollinearity will be tested for using Principle Components and varimax rotation Factor Analysis. These tests will highlight any association between the independent variables.

Contents

D.1 PRINCIPLE COMPONENTS

D.1.1 Correlation Matrix

As a first step in considering the association between the independent variables, the correlation matrix is presented in Table D.1.1.

Table D.1.1 Correlation Matrix

		Ability	Cog.Style	Cog.Compat
Cog.Style	r	0.48		
	p	0.009		
Cog.Compat	r	-0.29	-0.01	
	p	0.15	0.94	
OCI	r	-0.53	-0.33	0.43
	p	0.005	0.10	0.02

Ability is significantly correlated to cognitive style and OCI. OCI is significantly correlated to cognitive compatibility. However, it is unclear whether the strengh of the relationships is significant enough to cause a collinearity problem. To test this a principle components and factor analysis test will be performaed. This will also assist in determining if any of the independent variables are the same constructs as any others.

D.1.2 Principal Component Statistics

Table D.1.2 summaries the principle components statistics. Principle component one (Prin1) is the only one with an eigenvalue greater than 1. As can be seen from the eigenvalue table, however, this component mainly consist of the three period forecast error data and is, therefore, not relevant. There is no VIF score greater than 10 which indicates that there is little intercorrelation.

Table D.1.2 Principal Component Statistics

Collinearity Diagnostics Variance Proportions

	Eigen value	Index	Inter -cept	F1	F2	F3	Abil	C.Stl	Cog. Comp	OCI
Prin1	6.53	1.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Prin2	0.96	2.6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.21
Prin3	0.34	4.3	0.00	0.03	0.00	0.00	0.00	0.00	0.15	0.04
Prin4	0.08	8.6	0.00	0.00	0.00	0.04	0.01	0.05	0.28	0.39
Prin5	0.03	13.2	0.00	0.82	0.10	0.18	0.00	0.00	0.08	0.02
Prin6	0.01	19.0	0.00	0.03	0.65	0.45	0.08	0.04	0.18	0.29
Prin7	0.01	23.2	0.15	0.05	0.09	0.15	0.10	0.87	0.01	0.00
Prin8	0.00	35.6	0.83	0.04	0.13	0.16	0.79	0.01	0.27	0.01
VIF				4.49	8.06	5.06	1.92	1.58	2.28	2.65

Even if the forecast error variables are included, the first principle component only accounts for 50.7% of the variation.

	Eigenvalue	Difference	Proportion	Cumulative
Prin1	3.550	2.137	0.507	0.507
Prin2	1.413	0.494	0.202	0.709
Prin3	0.919	0.402	0.131	0.841
Prin4	0.517	0.153	0.074	0.914
Prin5	0.363	0.204	0.052	0.966
Prin6	0.158	0.081	0.023	0.989
Prin7	0.076	0.076	0.011	1.000

Total Variance = 7

Eigenvectors

	Prin1	Prin2	Prin3	Prin4	Prin5	Prin6	Prin7
F1	0.459	-0.303	0.065	-0.130	-0.069	-0.810	-0.116
F2	0.475	-0.265	0.178	-0.131	-0.037	0.300	0.749
F3	0.432	-0.213	0.346	0.441	-0.213	0.374	-0.516
Abil.	-0.334	-0.389	0.447	0.333	0.629	-0.131	0.110
Cog.Style	-0.327	-0.053	0.669	-0.537	-0.378	0.020	-0.091
Cog.Comp	0.096	0.706	0.407	0.408	-0.121	-0.270	0.265
OCI	0.382	0.372	0.169	-0.451	0.627	0.147	-0.257

Principal Component Factor Loadings

	Prin1	Prin2	Prin3	Prin4	Prin5
F1	0.866	0.360	0.062	0.093	-0.041
F2	0.896	0.316	0.170	0.094	-0.022
F3	0.815	0.253	0.331	-0.317	-0.128
Ability	-0.629	0.462	0.429	-0.239	0.379
Cog.Style	-0.617	0.063	0.641	0.386	-0.228
Cog.Compat	0.181	-0.839	0.391	-0.293	-0.073
OCI	0.721	-0.442	0.162	0.324	0.378

Communalities

F1	0.894
F2	0.942
F3	0.957
Ability	0.996
Cog.Style	0.999
Cog.Compat	0.982
OCI	0.991

Variance and proportions

	Variance	Proportion	Cumulative
Prin1	3.550	50.7	50.7
Prin2	1.413	20.1	70.9
Prin3	0.919	13.1	84.0
Prin4	0.517	7.3	91.4
Prin5	0.363	5.1	96.6

There is, therefore, little evidence to suggest that ability, cognitive style, cognitive compatibility and OCI are measuring the same construct.

D.1.3 Factor Analysis

As a further test of whether the variables are measuring the same construct, a factor analysis (using varimax) was used. The results are summarised in Table D.1.3.

Table D.1.3 Varimax simple structure factor loadings

	Fact1	Fact2	Fact3	Fact4	Fact5
F1	0.859	0.183	-0.164	0.201	-0.233
F2	0.899	0.101	-0.112	0.168	-0.287
F3	0.938	-0.216	-0.170	-0.008	-0.004
Ability	-0.166	0.153	0.258	-0.914	0.207
Cog.Style	-0.227	-0.020	0.938	-0.235	0.105
Cog.Compat	-0.042	-0.964	0.009	0.126	-0.187
OCI	0.314	-0.275	-0.124	0.238	-0.862

Again, the first factor merely reflects the correlation between the forecast error variables. No common factor appears to be present between the other variables. Furthermore, the first factor only accounts for 37.2% of the variance.

Communalities			Variance and proportions		
			Variance	Proportion	Cumulative
F1	0.894	Factor1	2.608	37.2	37.2
F2	0.942	Factor2	1.120	16.0	53.2
F3	0.957	Factor3	1.031	14.7	68.0
Ability	0.996	Factor4	1.032	14.7	82.7
Cog.Style	0.999	Factor5	0.970	13.8	96.6
Cog.Compat	0.982				
OCI	0.991				

It would, therefore, appear appropriate to use the variables in a stepwise multiple regression model and test the performance model. The formal hypothesis is as follows:

Hypothesis 9

Ho: That forecast accuracy is not dependent upon group mix with regard to ability, interpersonal compatibility or cognitive compatibility.

D.2 REGRESSION MODEL: No Forced Variables

A stepwise multiple regression package was used to allow the automatic selection of 'best fit' variables. On the first run the only signignificant variables selected by the program were originator compatibility for inclusion (OCI) and cognitive compatibility. Cognitive compatibility added significantly to the power of the model. The results are summarised in Table D.2.

Table D.2 Performance Model

	Increase in RSQ
OCI	0.22
Cog.Comp.	0.12
Total	0.34

F-Ratio = 6.4134

Degrees of freedom = 2 & 24

Probability of chance = 0.0059

Constant = 0.1916

	Coeff.	Beta	F-ratio	Prob.	Std. Error
OCI	0.013	0.64	12.36	0.002	0.004
Cog.Comp	-0.002	-0.39	4.57	0.043	0.001

D.3 Model WITH OCI^2 FORCED IN

Previously the non-linear version of OCI was found to be more significantly correlated to performance than the linear form. Therefore, OCI^2 was 'forced into' the stepwise regression. The model now rejected cognitive compatibility as significantly adding to the model. This 'all OCI' model has a similar R^2 (RSQ) to the previous OCI and cognitive compatibility model. The results are summarised in Table D.3.

Table D.3 Model with OCI^2 Forced in

	Increase in RSQ
OCI^2	0.26
OCI	0.07
	0.33

F-Ratio = 5.8292

Degrees of freedom = 2 & 24

Probability of chance = 0.0086

Constant = 0.1183

Var.	Coeff.	Beta	F-ratio	Prob.	Std.Error
OCI	0.0013	0.3228	3.6589	0.0678	0.0007
OCI^2	0.0103	0.5138	9.2672	0.0056	0.0034

D.4 PERFORMANCE MODEL, PERIODS 2 and 3

To check the 'all OCI' model it was re-run using period two and period 3 errors. The result was confirmed. These results are summarised in Table D.4.1 and Table D.4.3.

Table D.4.1 Model in Period 2

	Increase in RSQ
OCI	0.30
OCI^2	0.19
Total	0.49

F-Ratio = 11.64

Degrees of freedom = 2 & 24

Probability of chance = 0.0003

Constant = 0.1014

Var.	Coeff.	Beta	F-ratio	Prob.	Std. Error
OCI	0.0098	0.6038	16.97	0.0004	0.0024
OCI^2	0.0014	0.4402	9.02	0.0062	0.0005

Table D.4.2 Model in Period 3

	Increase in RSQ
OCI	0.16
OCI^2	0.16
TOTAL	0.32

F-Ratio = 5.53

Degrees of freedom = 2 & 24

Probability of chance = 0.011

Constant = 0.0851

Var.	Coeff.	Beta	F-ratio	Prob.	Std. Error
OCI	0.0048	0.4472	6.9023	0.0148	0.0018
OCI^2	0.0009	0.3998	5.5166	0.0274	0.0004

D.5 COGNITIVE COMPATIBILITY FORCED IN.

To test the impact of cognitive compatibility it was also forced into the model. Period 2 errors were used. As can be see from Table D.5 it did not add to the R^2 (explanatory power) of the model.

Table D.5 Model with Cognitive Compatibility Forced In

	Increase in RSQ
Cog.Comp	0.00
OCI	0.41
OCI^2	0.12
Total	0.53

F-Ratio = 8.5554

Degrees of freedom = 3 & 23

Probability of chance = 0.0005

Constant = 0.1298

Var.	Coeff.	Beta	F-ratio	Prob.	Std. Error
Cog.Comp.	-0.0009	-0.2217	1.7076	0.2042	0.0007
OCI	0.0012	0.3696	5.7418	0.0251	0.0005
OCI^2	0.0112	0.6908	18.8611	0.0002	0.0026

It appears, therefore, that OCI is the variable which is the most significantly correlated to performance.

CHAPTER 7: DISCUSSION OF RESULTS

This chapter discusses the results found in this study and compares them to previous studies. It also suggests future research opportunities and discusses the implications of the study.

INTERPERSONAL COMPATIBILITY

Individual Scores

The students used in this study had average FIRO-B scores of 22.3. These scores are less than those reported by Wetthen and Cameron [1984] but are comparable to those of Hill [1974]. Hill [1974] used the term "social interaction index" to describe the total score from the FIRO-B instrument, and he specifically studied accounting majors. For this group he reported a social interaction index of 22. The results of this study, therefore, appear to be typical for the type of subjects used[1].

The distribution of the students' individual interpersonal scores were non-normal and bi-modal. This result is consistent with Schutz [1966] who suggested that students had strong feelings about working in groups and that this would polarise their responses.

The intercorrelations between the six variables on the FIRO-B instrument (EI, WI, EC, WC, EA, WA) were similar to those reported by Schutz [1966]. WI and EI, WI and EA, WI and WA, EA and WA, and WI and WC were significantly correlated. With the exception of the correlation between WI and WC these results were consistent with those of Schutz. He did not report a significant correlation between WI and WC. However, the relationship between WI and WC found in this study is intuitively appealing. It seems

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1. This finding supports the validity of the FIRO-B instrument, and validates the students' responses.

reasonable that a person who wants to be accepted in to a group would have high affection needs and be willing to accept authority. It is not clear why Schutz found no such relationship. Given this inter-correlation within the instrument, and Schutz's own expectation of inter-correlations, significantly inter-correlated clusters were sought using principle components analysis but none were found.

Group Scores

The distributions of the inter-personal group scores all tended towards normality. Given the possible range of 0 - 36, it is concluded that the distribution of the means of the interpersonal group scores (see Table 7.1) were approximately centred around the theoretical mean of 18.

Table 7.1: Mean Group Scores

EI 16.1	EC 13.6	EA 13.0
Wi 19.8	WC 12.9	WA 18.9

While this result may appear to validate the FIRO-B instrument to should be noted that there is a tendency for the distribution of *any* grouped data to approximate a normal curve. Whatever the reason, however, the distributions are suitable for parametric tests.

Generally, the individual and group scores were as predicted by Schutz's FIRO-B instrument. This study, however, used a different experimental design than earlier work[2]. It allowed self-selection, it presented the questionnaire after the assignment was completed and it used a large cognitive assignment. The study has, therefore, generalised the validity of the instrument.

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2. It has also added to the literature on the validity of the instrument.

Forecast Error

This study used forecast error as a measure of performance. This is unusual in the management literature. Forecasting is a cognitive task which contains a number of interacting variables which have different levels of sensitivity. It may, therefore, be a more realistic measure of management performance than other measures such as production levels. The results of this study also support the suggestion that forecast error is an appropriate measure of managerial performance. During this study, the mean forecast error scores fell from 11.6 to 8.9 over the three periods. The 99% confidence interval was also reduced. The distribution was approximately normal (K-S = 1.09) in the first period, but the K-S statistic dropped to 0.59 by the third period. This suggests that there was learning over period of the study. The normality of the data also made it amenable to parametric testing. Furthermore, the students did not express any concerns with the measure.

Group Total Scores Against Performance

There was a significant correlation between the group's total wanted inclusion score and the forecast error. This can be viewed two alternative ways. First, it may be seen as evidence to support the hypothesis that groups composed of those who want to be accepted as group members will work harder to achieve the group goal. The non-linear relationship between total WI score and error may be explained using Hewitt's suggestion that an over-enthusiasm to please the group may result in more "group-member" cohesion (group-think) than "group-task" cohesion. This would probably result in limited constructive criticism of performance and a subsequent sub-standard performance.

An alternative explanation for the correlation between total group wanted inclusion scores and forecast error is that the group *compatibility* on inclusion is being indirectly measured. Given the robustness of the statistical methods used and the

significant correlation between OCI and forecast error, the correlation between the group total wanted inclusion score and forecast error may merely be reporting the relationship between two measures of compatibility. The correlation between the total group wanted inclusion score and forecast error, and between OCI and forecast error, are significantly improved by using the non-linear form. This may be seen as further evidence that they are two measures of compatibility. However, if total inclusion was an indirect measure of compatibility then it would be expected that *all* the compatibility measures would be significantly correlated to forecast error. Table 7.2 shows the correlations between total wanted inclusion and the three

Table 7.2. Correlation of Inclusion Scores

		Total WI	RCI	OCI
RCI	r	-0.51		
	p	0.01		
OCI	r	-0.44	-0.13	
	p	0.02	0.53	
ICI	r	-0.38	0.34	-0.34
	p	0.05	0.09	0.08

inclusion compatibility measures (RCI, OCI, and ICI). Total wanted inclusion is *negatively* correlated to all three of the inclusion compatibility measures but only OCI is correlated to forecast error. It should be noted that only one type of inclusion compatibility, OCI, was significantly correlated to performance. This suggests that "total wanted inclusion" is different from "compatibility'.

Total Wanted Inclusion and Feedback

The impact of feedback was tested by correlating the total wanted inclusion score

against the change in the forecast error over the three periods. At the 7% confidence level there was weak evidence that groups with a high total wanted inclusion score improved their performance more than other groups. This result was expected. Members trying to please the group would be expected to be more sensitive to feedback. The low level of association was unexpected. It was expected that compatible groups would improve noticeably with feedback. One possible explanation for this result is the high degree of compatibility in all the groups. This will be discussed later when self-selection is considered.

Total Group Expressed Control

It has been suggested that expressed control is a function of competitive drive [Schutz,1966]. However, in this study the total group expressed control score was correlated to forecast error. There are at least three reasons why total group expressed control scores may not be related to performance. First, a high competitive drive may be more relevant for physical repetitive tasks. This study used a detailed cognitive task in which cognitive style may be more relevant than enthusiasm[3]. Second, the mode of the individual expressed control scores was 0, with a mean of 3, from a possible range of 0 - 9. This suggests a low level of desire to control others. If expressed control can be interpreted as a measure of competitive drive these scores suggest a low competitive drive. Third, Schutz [1966] found that compatibility was more significant than total control scores. That is, he found that a group with "too many" members with a high expressed control score resulted in incompatibility, and consequent inefficiencies. These three arguments suggest that the failure to find a significant relationship between total expressed group control and performance could have been anticipated.

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3. Performance was found to be correlated to cognitive style (see later).

Compatibility

The calculation of compatibility was a problem because of the limited details provided with the FIRO-B instrument and because of the number of different ways that it has been calculated in other studies. Most of these calculation methods were tried and they all gave similar results. However, some of the methods are illogical. Often, what was intuitively a compatible group received an incompatible score. It was eventually decided to identify one person as the "high score" for the group and to attribute the label of "manager" in Schutz's "manager - subordinate" [1966; Whetten and Cameron, 1984] explanation of the compatibility calculations. The average score for the rest of the group represented the "subordinate'. Using this approach the significance of the correlations was slightly improved but not by enough to change an insignificant result into a significant result. The most appropriate way to measure compatibility is an issue that must be resolved.

For Reciprocal Compatibility on Inclusion the 99% confidence interval was 3.4 - 5.3 and the theoretical range was 0 - 18. Whetten and Cameron [1984] suggested that a score of less than 6 indicated a compatible group. Using the Whetten and Cameron criterion, it would appear that members formed groups which had reciprocal compatibility on inclusion. If this score was non-random, then students were somehow aware of each others expressed and wanted inclusion needs. For example, those who wanted a group they could dominate found others who wanted to be accepted by a group.

For reciprocal Compatibility for Control (RCI) the 99% confidence interval was 4.8 - 7.7. This indicates that *most* groups could be classified as "compatible" for this aspect of control. The results are slightly higher than for inclusion, but with a possible maximum of 18, the mean was only slightly above the Whetten and Cameron critical figure of 6.

Each of the nine compatibility scores suggested a high degree of compatibility. It is

difficult to understand how the students were able to balance all the compatibility types. One possible explanation is that aggregated data are being used[4] and that this has the effect of removing extreme scores. However, the result may actually be evidence that the students self-selected for compatibility. One alternative possibility is that the students selected co-members on the basis of "ability" rather than on inter-personal compatibility. This possibility has been tested and is discussed later. Concern about "ways of working" or cognitive style might have prompted students to avoid selecting purely on interpersonal compatibility grounds. This possibility is also discussed later.

In brief, this study tested whether interpersonal orientation, ability or cognitive style was the main criterion used for selecting co-members. The results suggest that interpersonal orientation was at least one criterion used by students. This seems to be a novel conclusion as this point has not been extensively tested. Most previous studies placed students in pre-planned groups. This study has, therefore, served to generalise the compatibility literature.

Compatibility and Performance

The fourth hypothesis was concerned with the association between compatibility and performance. Only OCI was significantly correlated to forecast error. Originator compatibility (OCI) requires there are not "too many", or "too few", members that want to initiate group decision making. The correlation between OCI and error was steady for the three periods suggesting that this is not a spurious correlation. The parabolic form of the regression model was more significant than the linear model. This supports the theoretical distinction between apathetic compatibility, where no-one wants to initiate, and aggressive compatibility, where were too many want to initiate. However, the results from the linear model were significant in spite of the

4. The individual scores are accumulated for group scores. These groups scores are then aggregated again to provided a mean for the group.

theoretical "n" shape. This was because the actual data range had more of an "r" shape. The "apex" of the curve suggested that slightly apathetic compatible groups performed better than totally compatible groups. This supports Hill's [1975] finding that a small amount of incompatibility was preferable. It also experimentally confirms the "groupthink" hypothesis.

Inclusion compatibility was expected to be significantly correlated with performance. The task was performed over several weeks with the group meeting as it wished. This meant that inclusion needs would probably have been more relevant than control or affection needs. Schutz suggested that during a long intense assignment, first the inclusion, then the control and then the affection compatibility needs will become relevant. The assignment, and the procedure for completing it, were designed to be typical of a small group preparing a budget in a commercial setting. It differed from the intensive one day sessions used in many other compatibility experiments. The result found, of originator inclusion compatibility being significantly correlated to performance, was therefore expected to be one of the stronger associations.

Interchange compatibility (IC) measures compatibility in emphasising, say, affection needs over control needs. Non of ICI, ICC or ICA were correlated with performance. If there was only time for inclusion needs to become relevant, then this type of incompatibility might not have been relevant.

Reciprocal compatibility (RC) measures the difference between wanted and expressed compatibility scores. Non of RCI, RCC or RCA were correlated with performance . Given the generally low levels of incompatibility it is likely that there was insufficient reciprocal incompatibility to affect performance.

Much of the compatibility research does not distinguish between the types of compatibility. Rather the absolute sum of all the types of compatibility is used. In this study, the absolute sum was not significantly correlated to performance. Given

the comments just made about the possible irrelevance of control and affections needs, and also given the high degree of compatibility found generally in the groups, the sum of all the compatibilities would not be expected to be significantly correlated to performance.

A major objective of this study was to test the relevance of inter-personal compatibility to a task such as budgeting, where mangers have some power of selection over their choice of colleagues and where the task was only one of many which were being undertaken at the same time. The study differed from the earlier work by allowing self-selection and by running the task over several weeks, while the subjects were involved in other tasks. Given the amount of laboratory experimental research that has found a significant correlation between compatibility and performance, the findings presented here suggest that not all the types of compatibility may be relevant to commercial budgeting. Future field research in this area should concentrate on inclusion needs compatibility, rather than the other types.

Compatibility and Feedback

The feedback literature, summarised by Luckett [1989], concludes that appropriate feedback alters performance. This was apparently confirmed in this study. The mean forecast error fell over the three periods and, therefore, it is concluded that learning occurred. Of particular interest in this study is the influence of compatibility on the rate of learning. The argument introduced in the literature review was that groups would experience stress upon receiving negative feedback. This stress would then be used constructively by compatible groups to improve performance. For incompatible groups, however, negative feedback would lead to un-constructive internal conflicts. To test this question, OCI was used to test if compatibility improved relative performance over the three periods. It is acknowledged that three periods maybe too few to enable any conclusive results but Mock et al. [1972] had reported learning occurring mainly in the first few periods.

The result of the feedback tests are inconclusive. However, the following points should be noted. Firstly, compatibility is correlated with forecast error for all three periods. Secondly, the strength of this correlation does not alter significantly over the three periods. Thirdly, the sequential change in forecast error is correlated to the level of compatibility. These results suggest that the amount of learning was related to compatibility. This is consistent with the compatibility theory for OCI. However, these tentative results should be treated with caution as only three periods were available for analysis.

COGNITIVE STYLE

Individual Scores

While there does not seem to be any accepted empirical evidence on the information processing cognitive style of accountants, the conventional wisdom is that accountants are receptive, systematic information processors. The individual scores recorded in this study are not consistent with this view. They suggest that student accountants have no dominant preferred information processing cognitive style.

Keen's instrument [1973] was used to measure the preferred cognitive style of the student subjects for both gathering information and evaluating information. For gathering information style (perceptive-receptive) the students individual scores were not distributed normally. However, contrary to Keen's prediction that they would form a bi-modal distribution, they were clustered around the mid point on the scale. The instrument has either failed to distinguish between the preceptive and receptive styles or the subjects were neither strongly perceptive nor strongly receptive. As there are no comparable studies in the literature it was not possible to compare the scores found here with a "database'.

For a evaluating information style (systematic - intuitive) the students individual

scores were approximately normal (K-S = 0.9). with no evidence of a bi-modal distribution. This also is not consistent with Keen's theory.

While Keen theorised that subjects would have extreme styles on both scales (gathering and evaluating) he did not find it empirically. He found that most of his subjects did not have extreme styles. The scores obtained in this study are, therefore, compatible with those found by Keen. The Myers [1980] empirical evidence, and other cognitive styles studies [Huber, 1983] are consistent with this finding. Keen attempted to explain these results by suggesting that people may switch styles, or that it may take time for a preferred cognitive style to develop. As the mean age of the student subjects was 21, they may not yet have established a preferred style. Alternatively, the result may indicate that people who select a career in accountancy do not have a strong preferred style.

Group Scores

When the individual cognitive style scores were summed to make group scores, the distribution of both the gathering and evaluating scores closely approximated a normal curve. However, the mean was slightly above the theoretical mid-point and the lower 99% confidence interval was very close to the theoretical mid-point. There were few groups with a dominant receptive style, but many had a dominant preceptive style. There were also few groups with a dominant intuitive style. Many, however, had a dominant systematic style. This suggests that the student subjects preferred to be in a group that had dominant preceptive and systematic styles. This combination means that the groups' thinking styles would "jump from one section of data to another ... focus on relationships" and tend to "defend the quality of a solution largely in terms of method" [Whetten and Cameron,1984] .

The hypothesis that there was no association between the mix of cognitive styles of a group and forecast error was tested by correlating the group total scores against forecast error[5]. It was found that high preceptive style scores were correlated to low forecast errors. The strength of the correlations appeared to be declining over time but the Fisher "r" to "z" score test showed that these declines were in-significant. When these information gathering scores were correlated against the change in forecast error from the first to the third period a non-significant result was obtained. Both these results suggest that learning was no better for the groups with higher preceptive scores than for other groups. The information evaluation scale was not significantly correlated to forecast error. No evidence was found, therefore, to confirm or to deny the traditional perception of accountants as systematic. However, some evidence was found to support the view that a preceptive style was useful in dealing with a cognitive task. As the task is typical of the planning stage of budgeting it may be possible to generalise this finding to commercial budgeting.

Cognitive Compatibility

The group total scores are a crude measure of group cognitive compatibility. As mentioned, the *individual* scores for cognitive style had a mean at the theoretical mid-point. The mean of the *group total* scores, however, was above the theoretical mid-point. This suggests that students with similar cognitive style form groups. This finding was supported by summing the differences in cognitive style scores for each dyad[6] that made up a group. The 99% confidence interval was from 17.3 to 30.2 while the possible range was 0 to 96. Therefore, cognitive compatibility as well as inter-

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5. An attempt was made to cross classify groups by both information gathering and information evaluation style. Four classifications were used with, for example, groups with high intuitive scores and low preceptive scores in one group and high intuitives and high preceptives in another. However, there were insufficient numbers in some groups to conduct a Chi ^{2} test. Visual observation and Lambda suggested no relationship between these groups and error.

6. The calculation of cognitive compatibility was performed using every dyad because it mirrored the calculations used for inter-personal compatibility. The procedure of electing one member as the strongest style and comparing this with the group average was tested but it gave a limited range of data.

personal compatibility appear to be the result of self-selection. This finding suggests that group members were aware of cognitive style, as well as inter-personal compatibility, when forming their groups. An alternative explanation is that cognitive compatibility and interpersonal compatibility are the same construct ($r = 0.43$, $p = 0.02$). This will be discussed later.

Cognitive compatibility was not significantly correlated to performance. While this result appears to be inconsistent with other findings, the particular context of this study must be remembered. The study used small self-selected groups which met at infrequent intervals over a few weeks. In this situation, Keen [1973] argued that an incompatible group would be able to work effectively provided that there was a system of intermediaries. These intermediaries were expected to mediate between extreme styles. As mentioned in the literature review, Hayward and Everett [1983] studied resignation patterns and found that a cognitive "climate" tended to develop in which people of a particular cognitive style clustered together, making other styles feel un-welcome. This is a very different situation to a small group working on a specific task for a limited period which may be able to suppress, or work around, any differences. That is, task cohesion may be strong enough to off-set a lack of group cohesion. However, in the longer term, given offers to join a more cognitively compatible group, members may elect to move. The subjects in the study were not allowed to change groups, but they had some influence over selecting their fellow members and met infrequently. It is, therefore reasonable to assume that it was possible for them to tolerate their differences.

Cognitive compatibility, however, is not only about the degree of pleasure that results from working with people of similar styles. It is also concerned with types of solutions. This study did not consider the elegance with which information was processed or the elegance of the strategies that were used. It also did not control the time taken by the groups in making their forecasts. Some of the cognitive style literature has been concerned with these issues and how they inter-relate. As this

study was concerned with generalising the purely experimental research it was not considered relevant or appropriate to control for time or to appraise strategies.

ABILITY

Individual Scores

The distribution of the individual ability scores was approximately normal (K-S = 0.7) with a 99% confidence interval around the mean of 62.3 - 68.8. The maximum was 93 and the minimum 30 which is a reasonable range. It was, therefore, believed that the data was suitable for use in further statistical tests.

Group Mix

Similarity theory suggests that high ability members will not invite low ability members into their group. This ignores the importance of the inter-personal and the cognitive needs of the high ability students. Schutz [1966] found that inter-personal needs were more relevant than ability for group performance. This study considered, therefore, the question of whether students selected other group members for ability, interpersonal compatibility or for cognitive compatibility. Evidence has been presented that the groups were largely compatible on both interpersonal and cognitive grounds. This section of the study tested to see if ability-compatible groups were formed and whether there was a relationship between group ability scores and forecast error.

Before discussing the results of the tests we should consider the alternative strategies which members may use to influence who becomes co-members of their group. It may not be reasonable simply to assume that low ability students are blocked from entering high ability groups by the high ability members. The low ability members may not seek membership in a high ability group. The low ability students may have

justified their past performance to themselves so that they do not want to group with high ability students. For example, if low ability students excuse their performance by saying high ability people are arrogant or lack common sense, then they may deliberately seek out low ability co-members. Alternatively, low ability students may have less task commitment and wish to avoid high ability students in order not to spend more time on the task than they wish. Whatever the reasoning, it seems likely that high ability students will group together and that low ability students will form groups of their own.

The casual observation of the group ability mix gave no clear impression of a re-occurring mix. There was no casual evidence that high ability students did not mix with low ability students. To test this impression the standard deviations of the members of the group's ability scores were calculated. The 99% confidence interval of the mean of the distribution was below the theoretical mean, indicating a narrow distribution. This may be interpreted as very weak evidence that groups of similar abilities were formed. An ANOVA test was also performed as an indicator of whether the groups appeared to come from the same population. The resulting "F" statistic suggested that the groups were not similar. The results were, therefore, inconclusive and did not support the suggestion that students of similar ability formed groups. It would appear that students selected co-members using more criteria than just ability.

Tziner [1986] also suggested an equity theory approach to understanding the impact of ability mix on group performance. Equity theory suggests that if there is one low ability member in a high ability group then the performance of the low ability member will improve. Similarly, a high ability member in a low ability group will have decreased performance. Equity theory could not be tested as a comparison of individual performance before and after working in a group was not available.

Ability and Performance

To test similarity theory the standard deviation of the groups' ability scores were correlated with forecast error. No significant correlation was found, which suggested that groups comprised of similar ability members did not outperform groups with a wider range of abilities. Given the theories on interpersonal and cognitive compatibility, this result was expected.

The score of the maximum ability member of a group was not found to be significantly correlated with forecast error. This was tested as it had been suggested, as part of a leadership concept, that one able member could "lead" the remaining members to high performance. This argument is in contrast to the equity theory suggestion that the "most able" member's performance will decline. The leadership concept may be more relevant when the leader can undertake most of the task by his or her self. However, with the size of the task used in this study, it is unlikely that one person would do most of the work. In this situation where the role of the "most able" member would be to co-ordinate, rather than to undertake the task, compatibility would be more relevant. The lack of correlation was not surprising as intuition suggested that two able and compatible members would outperform one able member.

The groups combined or total ability scores were correlated against forecast errors. Only a weak correlation was found. In the first period the significance level was 6%, it was 5% in the second period and 23% in the third period. These results appear counter - intuitive. For individuals, high ability is equated to high performance, motivation and learning. This suggests that compatibility, as Schutz [1966] found, was a more important determinant of performance than ability. Later, in this chapter the relationship between performance and both compatibility and ability is tested for a joint effect.

Feedback and ability

The "z-score" tests, the weak correlation between total ability and performance, and the small improvements in performance over the three periods, suggests that high ability groups did not learn or improve more than low ability groups. However, it does confirm the lack of correlation between ability and performance. In other words, the provision of feedback did not appear to have a different effect on high ability groups than on low ability groups. Again, compatibility appears to be a significant moderating variable.

Participation and Ability

Hypothesis 5 was concerned with whether working in groups was of more benefit to low or high ability members. It was found that lower ability members gained more from being in groups than high ability members. This result is intuitively satisfying. It would be expected that low ability members would gain more from working in groups as the other members would make up for their weaknesses. Also, it is easier to improve a poor score than a good one. This result supports Goldman's [1971] conclusions but is inconsistent with similarity theory. Members of high ability do not appear to be getting as much synergistic benefit as low ability members from working in groups.

Ability and Cognitive Style

As mentioned in the literature review [eg. Green,1985], there has been discussion about the relationship between ability and cognitive style. Cognitive style theorists argue that ability is not the same as cognitive style. This study found an 0.48 significant correlation between the ability score and the preceptive (gathering information) cognitive style. However, no significant correlation was found between the systematic (evaluating information) cognitive style scores and ability. The significant result would appear to be support for the belief that ability and

information processing cognitive styles are the same construct. However, it is possible that the result merely reflects suggestions that students with preceptive cognitive styles do well at management accounting examinations. That is, the direction of the causal relationship may be either way. It was reported above that groups that have a dominant preceptive preferred style did well at the assignment in this study. As the task in this study involved typical management accounting problems the results may be reflecting the same underlying relationship. That is, preceptive cognitive styles are well suited to management accounting.

The results of this study strongly suggest an interdependence between ability, cognitive style and compatibility. So far performance has been correlated with these variables separately. This was done to identify a "short-list" of variables that could later be tested against performance in a multi-variate model.

Overall Performance Model

The variables considered for a multi-variate analysis were cognitive style, cognitive compatibility, originator compatibility for inclusion and ability. While cognitive compatibility was not correlated with performance it was felt to be sufficiently theoretically associated with ability, cognitive style and inter-personal compatibility to be included in the multi-variate model. While it is known that these variables are not completely independent it was not clear whether their inter-correlation was sufficient to effect their use as independent variables in a multiple regression model. In these circumstances principle analysis was used.

The first stage of the principle components calculations was to produce a correlation matrix. This indicated a significant correlation between ability and cognitive style (0.48), ability and OCI (0.53) and between OCI and cognitive compatibility (0.43). The principle components analysis did not support the suggestion that the same construct was being measured. This conclusion was confirmed using factor analysis.

The significant correlation between cognitive compatibility and OCI means that the null hypothesis 7, could be rejected. This hypothesis was included as it was not clear whether Schutz's interpersonal theory covered cognitive compatibility. As mentioned in the literature review, there has also been some debate about whether cognitive style is a personality variable. Gul [1984] argued that it was not. In this study Keen's instrument was used in place of the Myers - Briggs instrument. This was because Keen's instrument was believed to be less a measure of personality. The finding of a significant correlation between OCI and cognitive compatibility may be interpreted as some evidence that the FIRO-B instrument also measures cognitive compatibility. However, the correlation is only 0.43 and it is hard to relate the two theories. Again, the correlation only suggests that inter-personal compatible teams were also cognitively compatible. It may be that members of compatible teams were more aware or concerned about compatibility generally than, say, ability.

Regression Model

The lack of significant clustering or principle components suggested there was no significant multicolliniarity. Therefore, it was appropriate to use the variables in a multiple regression model. Stepwise multiple regression with no forced variables resulted in OCI explaining 22% and cognitive compatibility 12% of the variation of performance. Thus while the correlation between cognitive compatibility and performance was insignificant, when placed alongside interpersonal compatibility it appears to be a further explanation of performance.

The variables selected by the stepwise procedure did not include the non-linear form of OCI. When forced to use the non-linear OCI model, the total variation explained was very similar to that found from using the linear OCI and cognitive compatibility model. The non- linear OCI model result was confirmed using periods 2 and 3. This suggests that the non-linear form of OCI was a more important determinant of performance than a mix of types of compatibility, or a combination of compatibility

and ability. An attempt was made to force ability into the model but this did not improve the explanation of variation. The irrelevance of ability, compared to compatibility, was consistent with Schutz's theory. It would appear that the simplest model, the non-linear form of OCI, explained the variation as well as any other model,

FUTURE RESEARCH

Generalising This Study

Although budgeting is group task, most of the earlier research into the budget process has been at the individual level. A group perspective was required. There has been extensive research on small groups *per se*. However, the quantity of research about small *work* groups, performing managerial tasks, is small. In addition, as Tziner [1985] points out, if this research is further culled to include only research concerned with ability-mix issues then there is very little available, even when the measure of performance includes purely physical tasks. The research into small work group compatibility has been much more extensive but it has largely been experimental research in controlled and simplified settings. It has also been more concerned with physical rather than cognitive tasks. The research on cognitive compatibility has also been very limited. Much of the little work that has been done is now old. The interaction of performance, ability, inter-personal compatibility and cognitive compatibility has also not been widely researched. The issues of group feedback, group learning and of self-selection have also not been widely considered in the small *work group* research on managers' performance. Therefore, there is scope for future research in the general area of small work group dynamics when the group is working on a planning task (allocating limited resources), over a reasonable time period, and in a flexible group and meeting environment.

This study has concentrated on the planning aspects of budgeting and has ignored the control aspects. If a group is responsible for implementing a decision then the group stresses may be greater than for a planning task. The inter-personal dimension, especially control needs, may be even more relevant than ability. The required measure of ability may also be different. These issues could be further studied

As mentioned, group compatibility has been well studied but in a laboratory setting.

This study has generalised that work to a task and organisational setting more typical of budgeting. However, a full field study would be useful. An interesting piece of quantitative research would be to study staff turn-over (including transfers) using inter-personal compatibility and cognitive compatibility as independent variables. Alternative career opportunities may influence turn-over and this should be included as a variable. However, it would be interesting to confirm that the pressures on either an interpersonal or cognitive incompatible budgeting group were strong enough to be reflected in turn-over figures.

Qualitative Questions

The major limitation of *quantitative* research in this area is that the internal processes of the group are not investigated. For example, the perceptions and thoughts of the compatible and incompatible group members is not clear. Nor is how the group will cope with its incompatibilities or how members identify compatible members. To use post assignment interviews, after a study such as this one, would be of very limited use for these reasons. First, this study was concerned with behaviour and not with feelings. Interviews would have to be more about feelings. Second, it is necessary to capture the events as they happen, not as they are remembered. As mentioned in the methodology, qualitative research must be a full, carefully planned and constructed piece of work. The researcher would have to be fully integrated into the group, recording events as they occurred. Third, if qualitative research is to be undertaken it would better be done as a field study. Working with an actual budgeting group, knowing their ability, inter-personal orientation and cognitive style and the other day to day pressures they work under, would give a much fuller understanding.

It would be useful to know how accountants and other managers rank ability and inter-personal orientation as important attributes when working in a budgeting group. The budgeting literature has emphasised the "organisational" dimension of budgeting. The question is, how important is good communications in preparing and implementing a

budget compared to technical expertise? As communications are dependent on inter-personal and cognitive orientations it would be interesting to know if ability is perceived as being as important as "working well in a group'. If compatibility is important, then does it mean a compromise on ability? Answers to these questions would best be found by longitudinal qualitative methods.

Self-Selection

It would assist future research if it was clear how much influence managers have in selecting co-workers. What are the effects of having to work with incompatible people? Influence over the number of meetings, the use of subordinates, task allocation and recruitment, may be used to make incompatibility a short term problem. If managers have a high degree of choice about how groups perform a task, then incompatibility problems may not be relevant. Indeed, Janis [1972] is concerned that many planning groups suffer from what he calls "group think'. He sees the problem as insufficient incompatibility, which results in a lack of constructive criticism. A related research question would be how do budgeting groups ensure the presentation of pessimistic points of view?

Sciometric network analysis

Sciometric network analysis has been heralded as a powerful tool for the analysis of groups. It has been used in a wide range of applications but not in budgeting. For example, it would be interesting to construct a "who talks to whom when budgeting', network. This could be compared over industry and time. Using this information, typical clusters and key "nodes" could be identified. Participants' attributes (including ability and inter-personal orientation) could be compared with their position in the network. The strength and reasons for connections could also be studied. The network may further provide explanations of, say, implementation or change problems.

Participation

Participation in budgeting is now a well established research topic. Intervening variables such as locus of control and product technology have also been studied. However, the compatibility literature introduces the question of whether members want to participate in group activities. This is not a new concept in budgeting [French et.al.,1966]. If two managers have very strong needs to work together then it may be difficult to stop them. If they are incompatible, any attempt to force them to work together will be resisted. It is, therefore, suggested that future research on participation should include inclusion compatibility as an intervening variable.

Motivation, Cohesion, Goals, Norms and Feedback

Many theories of motivation, including goal setting and feedback, mention interpersonal aspects or peer pressure. Generally these have been ignored in the budgeting literature. Future research on these topics may consider using the small group level of analysis rather than an individual perspective. This would lead to more appreciation of group motivation variables. Woven into this complex topic is the distinction between group and task cohesion. Future research should keep clear the distinction between these two types of cohesion. The issue of compatibility will probably be more relevant to group cohesion than to task cohesion. Indeed, more study of the construct "group cohesion" and the construct "compatibility" is necessary to explain their relationship.

SUMMARY AND CONCLUSION

Small Group Perspective

The main aim of this study was to explore the small group dynamic aspects of budgeting. While some aspects of small group dynamics have been well studied in the past, they have not been integrated with the budgeting literature. Yet, many of the hypothesis that have been mentioned in budgeting, such as motivation, feedback, cohesion, and goals do have a major interpersonal component.

Operational budgeting is a complex and unique task. Typically, the experimental research has used trivial tasks. When real production tasks are used they are usually simple manual tasks which are measured in quantity of output or time taken. Budgeting is a middle management task. It requires some technical skills, which are both calculative and cognitive, but it also requires skills such as strategy formulation, imagination and subjective decision making. To encourage the maximum use of these qualities, managers need to be able to choose how, and with whom, the task is undertaken. This provides scope for personal needs to act upon the task. There is little point in denying or controlling these needs. They should be exploited.

Self-Selection

Most of the compatibility and ability-mix literature first tested the subjects and then allocated them to controlled groups. It was found that incompatible groups did not perform as well as compatible groups. It was also found that high ability people in low ability groups did not perform as well as high ability people in high ability groups. Even though these results were based on tasks which were often very different to budgeting, it was believed that they were applicable to budgeting. To confirm that it was appropriate to generalise these findings, it was decided: to test how important subjects perceived incompatibility to be when selecting co-members; and to test

whether ability or compatibility was considered more relevant to subjects when selecting co-members. This required the subjects to select their own group members.

Independent Variables

This study started informally by asking people with budgeting experience what personal factors would influence the performance of a small group of managers. Ability, personality and "working style" were all mentioned. This mix of variables had not been well studied in the management literature possibly because ability or intelligence testing had been viewed as an individual concept and the group compatibility literature had suggested that ability was not as important as compatibility.

Ability is a poorly constructed variable. There are many types of ability and most complex management tasks require most of them. It was decided that ability, in this case, meant the technical ability necessary to construct a co-ordinated budget. The management accounting exam mark was used as a measure of this interpretation of ability. The psychology literature on personality variables was dominated by Schutz, so his instrument was used. His instrument has six variables. These are the result of extensive factor analysis and have been tested against a range of other instruments. Schutz believes he has captured most of the personality variables mentioned in the psychology literature. Some of these variables are now being mentioned in the budgeting literature, they include, for example, authoritarism. Rather than deal with these variables independently it was believed that using Schutz's "factors" was a more productive approach.

Cognitive style was used as a measure of "working style'. As there was some suggestion that different styles do not work well with each other, the variable had the added advantage of having a group dynamic aspect. This literature was dominated by the Myers-Briggs instrument but as it is generally believed to be a personality

measure it did not seem appropriate for this study. Instead Keen's information processing cognitive styles measure was used.

Performance Measure

Forecast accuracy was used as the measure of performance. The task involved formulating a strategy to move a simulated manufacturing company into a profitable position. The student subjects were expected to improve the company's financial position and to produce an "accurate" estimate of the impact of their decisions. The errors in these forecasts were used as a measure of performance. Apart from the "reality" of the measure it had the useful attribute of making satisfying difficult. One problem with the measurement of performance is that subjects can decide on a goal which satisfies but which is not the maximum possible performance. If the research assumes that subjects are trying for maximum performance, then the results can be misleading. The design of the task used in this study made it virtually impossible for students to satisfy by aiming for, say, a 5% error. They were forced constantly to check whether they had the calculation correct, as the impact of an error was hard to assess.

Students as Subjects

This research stands between a laboratory experiment and a field study. There have been many experiments on compatibility but there was a need for quantitative and qualitative field studies. However, before the field studies were undertaken some initial generalisation of the laboratory experiments was necessary to provide more exact guidelines for the field study. There was a need to identify relevant variables and issues. Given the nature of the study, it would have been necessary to use many budgeting managers, working on a controlled task over several weeks. Such a supply of managers was not available. It was, however, possible to use accounting students as surrogates for budget managers. These students were embarking upon a career which

would include budgeting. They were, therefore, different from, say, English, physics or biology students who have been used in many psychology experiments. The study was not concerned with determining the nature or the processes of decisions by experts but rather with studying the influence of some long term personality variables on a particular type of performance. It was, therefore, believed that it would be possible to generalise to budget managers from the results gained from using the students.

RESULTS

Self-Selection

The results of this research supported the argument that when forming a work group, subjects were aware of interpersonal and cognitive compatibilities. They formed into compatible groups. No evidence was found that subjects selected co-members on the basis of ability or that any group measure of ability was strongly correlated to performance. However, working in a group appeared to be more beneficial to low ability subjects.

Performance

Of the nine measures of interpersonal compatibility suggested by Schutz's only one (OCI) was significantly correlated to performance. This result may be partly due to the large degree of group compatibility. There may have been an insufficiently wide range of incompatibilities to affect performance significantly. The task type and the opportunity for the group to meet at its own convenience may have made the control and affection compatibilities less relevant.

A significant correlation was found between a high group score on receptive style, information gathering styles and performance. There was no significant correlation between cognitive compatibility and performance which is consistent with the argument

that, within groups, intermediates may reduce the impact of incompatibilities. It has been suggested that cognitive compatibility has two effects. First, it may cause conflict between members and thus reduce performance. Second, it may ensure that a wide range of approaches are taken to a problem. No evidence was found to support either of these arguments.

Feedback

Feedback was found to affect the impact of interpersonal compatibility on performance. The performance of compatible groups appears to have improved more than for incompatible groups. There was no significant difference in improvement for groups with different cognitive styles or cognitive compatibilities over the three periods. Also, feedback did not appear to alter the relative performance of groups of different abilities. Feedback, however, did improve the overall performance of all groups. While three periods is only a limited test of the impact of feedback, the sequential test did provide some measure of the robustness of the associations. For example, there was a significant association between OCI and performance for each period. However, a significant correlation between ability and performance was only found in the second period.

Overall Performance Model

After checking that there was no problem of multicolliniarity, it was found that the best explanation of variations in performance, with the least variables, was the non-linear form of OCI. This result confirms Schutz's theory in a more generalised setting. The linear OCI model and cognitive compatibility resulted in a model with equal explanatory power. This result is interesting because cognitive compatibility was not, on its own, significantly correlated to performance. To have explained performance using a combination of these two types of compatibility would have had great intuitive appeal. However, cognitive compatibility added nothing to the non-

linear OCI model.

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APPENDIX A: The Questionnaires

Fundamental Interpersonal Relations Orientation–Behavior

For each statement below, decide which of the following answers best applies to you. Place the number of the answer at the left of the statement.

1. Usually 2. Often 3. Sometimes 4. Occasionally 5. Rarely 6. Never

_____ 1. I try to be with people.

_____ 2. I let other people decide what to do.

_____ 3. I join social groups.

_____ 4. I try to have close relationships with people.

_____ 5. I tend to join social organizations when I have an opportunity.

_____ 6. I let other people strongly influence my actions.

_____ 7. I try to be included in informal social activities.

_____ 8. I try to have close, personal relationships with people.

_____ 9. I try to include other people in my plans.

_____ 10. I let other people control my actions.

_____ 11. I try to have people around me.

_____ 12. I try to get close and personal with people.

_____ 13. When people are doing things together I tend to join them.

_____ 14. I am easily led by people.

_____ 15. I try to avoid being alone.

_____ 16. I try to participate in group activities.

For each of the next group statements, choose one of the following answers:

1. Most people 2. Many people 3. Some people 4. A few people 5. One or two people 6. Nobody

_____ 17. I try to be friendly to people.

_____ 18. I let other people decide what to do.

_____ 19. My personal relations with people are cool and distant.

_____ 20. I let other people take charge of things.

_____ 21. I try to have close relationships with people.

_____ 22. I let other people strongly influence my actions.

_____ 23. I try to get close and personal with people.

_____ 24. I let other people control my actions.

_____ 25. I act cool and distant with people.

_____ 26. I am easily led by people.

_____ 27. I try to have close, personal relationships with people.

For each of the next group of statements, choose one of the following answers:

1. Most people 2. Many people 3. Some people 4. A few people 5. One or two people 6. Nobody

_____ 28. I like people to invite me to things.

_____ 29. I like people to act close and personal with me.

_____ 30. I try to influence strongly other people's actions.

_____ 31. I like people to invite me to join in their activities.

_____ 32. I like people to act close toward me.

_____ 33. I try to take charge of things when I am with people.

_____ 34. I like people to include me in their activities.

_____ 35. I like people to act cool and distant toward me.

_____ 36. I try to have other people do things the way I want them done.

_____ 37. I like people to ask me to participate in their discussions.

_____ 38. I like people to act friendly toward me.

_____ 39. I like people to invite me to participate in their activities.

_____ 40. I like people to act distant toward me.

For each of the next group of statements, choose one of the following answers:

1. Usually 2. Often 3. Sometimes 4. Occasionally 5. Rarely 6. Never

_____ 41. I try to be the dominant person when I am with people.

_____ 42. I like people to invite me to things.

_____ 43. I like people to act close toward me.

_____ 44. I try to have other people do things I want done.

_____ 45. I like people to invite me to join their activities.

_____ 46. I like people to act cool and distant toward me.

_____ 47. I try to influence strongly other people's actions.

_____ 48. I like people to include me in their activities.

_____ 49. I like people to act close and personal with me.

_____ 50. I try to take charge of things when I'm with people.

_____ 51. I like people to invite me to participate in their activities.

_____ 52. I like people to act distant toward me.

_____ 53. I try to have other people do things the way I want them done.

_____ 54. I take charge of things when I'm with people.

The Cognitive Style Instrument

In this instrument you must put yourself in the position of someone who must gather, evaluate, or respond to information. The purpose is to investigate the ways you think about information you encounter. There are no right or wrong answers, and one alternative is just as good as another. Therefore, try to indicate the ways you *do* or *would* respond, not the ways you think you *should* respond.

For each scenario there are three pairs of alternatives. For each pair, select the alternative that is more like the way you would respond. Answer each item. If you are not sure, guess.

Suppose you are a scientist at NASA whose job it is to gather information about the moons of Saturn. Which of the following would you be more interested in investigating?

1. (a) How the moons are similar to one another
   (b) How the moons differ from one another
2. (a) How the whole system of moons operates
   (b) The characteristics of each moon
3. (a) How Saturn and its moons are unique compared to Earth and its moon
   (b) How Saturn and its moons are similar to Earth and its moon

Suppose you are the chief executive of a company and have asked division heads to make presentations at the end of the year. Which of the following would be more appealing to you?

4. (a) A presentation analyzing the details of the data
   (b) A presentation oriented toward presenting the conceptual whole
5. (a) A presentation showing how the division contributed to the company as a whole
   (b) A presentation showing the unique contributions of the division
6. (a) Details of how the division performed
   (b) General summaries of performance data

Suppose you are visiting the Orient, and you are writing home to tell about your trip. Which of the following would be most typical of the letter you would write?

7. (a) A detailed description of people and events
   (b) General impressions and feelings
8. (a) A focus on similarities of our culture and theirs
   (b) A focus on the uniquenesses of their culture
9. (a) Overall, general impressions of the experience
   (b) Separate, unique impressions of parts of the experience

Suppose you are attending a concert featuring a famous symphony orchestra. Which of the following would you be most likely to do?

10. (a) Listen for the parts of individual instruments
    (b) Listen for the blend of all the instruments together

11. (a) Pay attention to the overall mood associated with the music
    (b) Pay attention to the separate feelings associated with different parts of the music

12. (a) Focus on the overall style of the conductor
    (b) Focus on how the conductor conducts different parts of the score

Suppose you are considering taking a job with a certain organization. Which of the following would you be more likely to do in deciding whether or not to take the job?

13. (a) Systematically collect information on the organization
    (b) Rely on personal intuition or inspiration

14. (a) Consider primarily the fit between you and the job
    (b) Consider primarily the methods needed to succeed in the organization

15. (a) Be methodical in collecting data and making a choice
    (b) Give attention mostly to your personal instincts and gut feelings

Suppose you inherit some money and decide to invest it. You learn of a new high-technology firm that has just issued stock. Which of the following is most likely to be true of your decision to purchase the firm's stock?

16. (a) You would invest on a hunch
    (b) You would invest only after an organized investigation of the firm

17. (a) You would be somewhat impulsive in deciding to invest
    (b) You would follow a sequential pattern in making your decision

18. (a) You could rationally justify your decision to invest in this firm and not in another
    (b) It would probably be difficult to rationally justify your decision to invest in this firm and not in another

Suppose you are being interviewed on TV, and you are asked the following questions. Which alternative would you be most likely to select?

19. How are you more likely to cook?
    (a) With a recipe
    (b) Without a recipe

20. How would you predict the Super Bowl winner next year?
    (a) After systematically researching the personnel and records of the teams
    (b) On a hunch or by intuition

21. Which games do you prefer?
    (a) Games of chance (like Bingo)
    (b) Chess, checkers, or Scrabble

Suppose you are a manager and need to hire an executive assistant. Which of the following would you be most likely to do in the process?

22. (a) Interview each applicant using a set outline of questions
    (b) Concentrate on your personal feelings and instincts about applicants in the interview

23. (a) Consider primarily the fit between yourself and the candidates
    (b) Systematically consider the match of personal skills and position requirements

24. (a) Rely on factual and historical data on each candidate in making a choice
    (b) Rely on personal intuition or inspiration in making a choice

SCORING KEY

FIRO - B

To derive your interpersonal orientation scores, refer to the table below. Note that there are six columns, each with items and keys. Each column refers to an interpersonal need listed in the chart at the bottom of the page. Items in the column refer to question numbers on the questionnaire; keys refer to answers on each of those items. If you answered an item using any of the alternatives in the corresponding key column, circle the item using any of the alternatives in the corresponding key column, circle the item number on this sheet. When you have checked all of the items for a single column, count up the number of circled items and place that number in the corresponding box in the chart. These numbers will give you your strength of interpersonal need in each of the six areas. The highest possible score is 9. The lowest score is 0.

Expressed Inclusion		Wanted Inclusion		Expressed Control		Wanted Control		Expressed Affection		Wanted Affection	
Item	Key	Item	Key	Item	Key	Item	Key	Item	Key	Item	Key
1	1-2-3	28	1-2	30	1-2-3	2	1-2-3-4	4	1-2	29	1-2
3	1-2-3-4	31	1-2	33	1-2-3	6	1-2-3-4	8	1-2	32	1-2
5	1-2-3-4	34	1-2	36	1-2	10	1-2-3	12	1	35	5-6
7	1-2-3	37	1	41	1-2-3-4	14	1-2-3	17	1-2	38	1-2
9	1-2	39	1	44	1-2-3	18	1-2-3	19	4-5-6	40	5-6
11	1-2	42	1-2	47	1-2-3	20	1-2-3	21	1-2	43	1
13	1-2	45	1-2	50	1-2	22	1-2-3-4	23	1-2	46	5-6
15	1	48	1-2	53	1-2	24	1-2-3	25	4-5-6	49	1-2
16	1	51	1-2	54	1-2	26	1-2-3	27	1-2	52	5-6

Cognitive Style

To determine your score on the three dimensions of cognitive style, circle the items below that you checked on this instrument. Then count up the number of circled items and put your scores in the spaces below.

Gathering information		Evaluating Information	
Perceptive	Receptive	Systematic	Intuitive
1a	1b	13a	13b
2a	2b	14a	14b
3a	3b	15a	15b
4a	4b	16a	16b
5a	5b	17a	17b
6a	6b	18a	18b
7a	7b	19a	19b
8a	8b	20a	20b
9a	9b	21a	21b
10a	10b	22a	22b
11a	11b	23a	23b
12a	12b	24a	24b

APPENDIX B: The Scores

QUESTION	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
HAMID H	5	5	3	5	4	5	6	5	4	3	3	5	3	3	5	3	6
MUNIR M	3	5	2	6	2	5	3	5	2	3	2	3	3	2	3	3	3
INTAN SURI	4	3	3	5	4	5	4	5	3	2	3	4	3	4	3	3	6
KI THERESA	2	3	5	5	5	5	6	6	6	3	6	3	3	6	2	3	6
LYNETTE J	5	4	3	5	3	5	5	5	3	2	2	3	2	2	3	2	6
VICKI E	4	4	4	6	4	6	3	5	5	2	5	5	2	5	3	2	4
D GRAHAM P	2	5	3	6	3	5	2	6	3	3	3	3	3	3	3	3	2
YVONNE	3	3	3	5	3	5	3	3	3	3	3	4	3	3	3	3	4
PRISCILLA A	4	4	3	5	5	5	3	5	5	4	5	5	4	5	5	4	6
HAMISH D	4	4	3.	4	3	4	4	3	4	2	4	3	2	3	1	2	4
CAREY S	3	4	3	5	3	5	3	5	3	3	3	3	2	3	3	4	5
GLENN																	
NG T R	5	6	4	6	4	6	4	6	4	4	4	3	4	4	2	4	4
E ELIZABETH M	4	4	5	4	4	6	5	4	4	1	3	5	2	3	5	2	6
KATHRYN A	5	6	2	6	2	6	5	5	2	3	1	6	3	1	6	1	6
TIMOTHY C	3	5	5	6	5	5	2	6	5	1	5	2	2	3	2	2	3
S MARIA	4	3	4	4	4	4	5	5	4	2	4	5	2	4	4	2	6
M J	3	5	4	5	4	5	3	6	4	1	3	3	2	3	3	2	5
ANGELA L																	
ES G N																	
GRANT T	4	5	4	5	4	5	4	5	4	3	4	4	3	4	3	3	5
RICHARD B	4	4	4	3	4	4	3	4	4	2	4	5	2	4	4	2	4
US CHRIS D	2	5	5	6	5	5	2	5	5	3	4	4	3	4	3	3	3
AN SUSAN J	4	4	3	4	4	5	5	5	5	2	3	4	2	4	3	2	5
ELVA J	5	5	2	4	3	5	5	4	2	2	3	5	2	3	4	2	6
YOKE LING E																	
DAVID A	5	5	1	5	1	5	5	1	6	1	1	4	2	1	5	1	6
ROBYN P	5	3	4	5	4	6	5	6	5	4	5	5	4	5	5	4	4
P G	4	5	3	5	3	5	4	5	3	1	1	2	1	2	3	2	6
GRANT R	4	4	3	4	5	4	4	3	5	3	4	3	3	4	3	3	4
GARY G	6	5	1	5	1	5	6	5	1	2	1	3	2	1	3	2	6
PETER W	3	5	3	5	4	6	3	5	4	2	3	4	2	2	4	1	4
SON TANIA L	3	4	5	5	5	5	3	5	5	3	5	3	3	5	3	3	4
B G																	
ND JILL H	3	5	5	4	5	4	3	5	5	3	4	5	3	5	5	3	6
GRANT L	4	5	3	5	4	5	4	5	3	2	4	3	2	3	3	2	6
S K J	3	5	4	5	3	5	3	5	4	2	3	5	2	3	4	3	6
E RICHARD G																	
ARSON TANIA	4	5	5	4	4	5	4	5	5	3	5	5	3	5	5	3	5
KAYLENE A																	
BRUCE	3	3	5	3	5	3	4	3	5	4	4	3	4	4	4	4	5
BRIAN	5	6	4	6	5	6	4	6	5	2	3	3	2	3	3	2	6
B A	4	5	3	4	3	5	5	5	3	2	3	2	2	2	2	2	5
A R	4	4	4	3	4	3	4	3	4	2	4	4	2	4	3	2	4
SHANE A	3	5	4	4	3	5	4	4	3	5	4	3	3	4	4	4	5
JITESH	2	5	3	6	3	6	2	6	3	2	2	3	3	3	3	3	6
CARLITA	4	5	3	5	3	5	4	5	3	3	3	5	3	2	4	3	6
LIONEL N	4	5	3	5	4	6	5	6	4	2	3	4	1	3	4	2	5
JENNIFER																	
ANDREW D	3	3	3	4	3	4	3	4	3	1	1	4	1	1	4	1	6
MICHAEL W	4	5	5	6	5	6	4	5	5	2	4	2	1	4	1	1	6
STUART B	3	3	4	3	5	5	6	2	5	1	3	6	1	3	4	1	6
CRAIG A																	
)D ANNE L	5	4	2	5	2	5	5	5	2	3	3	5	3	3	5	3	5
ION D R																	
SUSAN J																	
RUSSELL G	2	3	4	3	4	3	3	3	4	3	4	4	3	3	3	3	6
BEVAN G	5	4	4	5	4	5	5	4	4	2	3	3	2	4	3	2	5
M B	5	5	3	5	3	5	5	5	3	2	3	2	2	3	2	2	6
L S	5	3	4	3	3	5	5	4	3	2	3	3	2	3	2	2	5

N L S	2	3	2	3	3	4	2	3	2	5	2	2	2	3	1	2	1
TONE PHILIP	3	3	3	2	3	3	3	2	3	3	3	2	3	3	3	3	2
TONE W J	5	5	5	4	3	5	5	5	3	5	5	4	3	5	6	3	1
TIM M	2	4	3	3	2	4	2	3	2	4	2	3	3	3	2	2	1
PATRICK	3	3	3	5	5	3	3	5	1	4	3	6	2	4	3	1	1
PAMELA																	
ROBIN																	
ANTHONY	3	4	4	4	5	5	5	4	3	5	4	4	5	4	5	4	1
SUZANNE																	
R G	3	4	5	4	5	5	4	4	3	5	3	4	4	5	3	4	1
E JENNY E	2	3	3	3	4	5	3	3	3	5	3	3	3	4	6	3	2
AY KAREN	3	4	3	4	3	4	2	4	3	4	3	4	4	4	5	3	2
GSTONE KAY	4	5	2	1	2	5	3	2	2	6	1	3	3	5	5	3	1
B J																	
NALD BRUCE	2	3	2	3	2	4	2	3	2	4	2	3	2	3	5	2	1
CHLAN ALLAN																	
B M	1	2	2	3	3	5	4	4	2	4	1	3	1	2	3	2	2
HA V	1	4	3	3	3	4	3	4	4	5	1	3	5	5	1	3	1
N ROGER	5	2	3	5	5	4	6	5	5	3	5	5	5	4	5	4	3
SCOTT	1	5	2	2	4	4	4	2	2	5	1	2	4	5	1	2	1
STEVEN	2	4	2	33	2	3	2	2	2	4	2	2	2	4	3	2	3
ELL BRUCE																	
L JEAN L	2	4	3	3	2	5	3	3	3	6	3	3	3	6	4	3	2
OSH R J	3	2	2	4	3	5	4	5	3	4	2	4	3	4	4	3	2
BRENT COLIN	2	1	3	2	1	5	3	3	2	5	2	3	2	5	3	2	1
LAY PAULINE	4	5	5	3	5	6	2	2	2	5	3	3	4	5	5	4	1
N DEBBIE	2	3	3	2	5	4	2	3	2	5	2	3	4	4	1	3	1
RY CRAIG	3	4	2	3	3	5	3	3	4	5	4	3	3	5	4	2	2
E ERICA	2	3	2	3	2	4	2	3	2	4	3	3	2	4	5	3	1
R JAMES	3	5	3	1	1	4	2	4	3	4	3	4	3	4	4	1	1
N A A	3	4	3	2	3	4	2	2	3	4	3	2	3	4	3	3	2
ELL DEAN	1	3	1	3	1	3	2	4	3	3	2	4	3	3	1	2	1
S AMANDA	3	4	1	4	1	5	1	4	3	5	3	4	2	5	4	1	1
S BLAIR	3	3	5	4	4	2	3	3	2	3	3	3	4	4	3	4	2
BRYAN																	
I GERARD	2	4	4	2	2	5	2	2	2	5	2	2	2	5	2	2	1
HILL T J	3	4	4	4	5	5	2	4	2	5	3	5	3	5	3	3	1
ANDREW	1	3	4	1	4	5	2	1	3	5	3	1	4	5	4	3	1
I JACQUI																	
IE CRAIG	2	3	2	2	3	4	2	2	3	4	2	2	3	4	2	2	1
IOR CHRIS	2	4	3	2	3	5	2	4	3	5	3	3	2	5	4	3	1
RICHARD	2	4	3	4	2	4	2	3	2	4	3	2	4	4	3	3	2
IPS D A																	
I PAULINE	3	4	2	3	1	3	1	3	1	3	3	3	1	3	5	3	1
FREDERICK	3	1	4	1	3	1	4	2	3	1	3	1	5	1	1	1	
ING M G	2	3	3	4	3	4	3	4	1	5	4	4	4	5	4	3	2
DIANNE	2	3	4	3	3	5	2	4	2	5	2	5	3	4	2	3	2
A AZLAN	3	4	3	4	4	5	4	3	3	5	4	4	3	4	4	3	2
DEAN	3	3	3	4	4	5	2	4	3	5	3	3	2	5	3	3	1
KATHRYN	1	3	4	5	5	5	3	5	1	5	1	5	1	5	1	3	1
I CRAIG R	4	1	2	2	4	2	2	2	4	2	2	2	4	3	2	2	
MATTHEW D	2	3	3	2	3	4	1	2	1	4	2	2	2	5	3	1	3
ERIC	3	3	3	1	3	3	1	3	1	3	3	3	3	3	3	2	2
ON STEWART	2	3	3	1	3	4	3	1	3	4	3	2	3	4	2	2	3
JUDITH	2	3	3	3	4	4	2	3	2	4	2	3	3	4	1	3	2
TIMOTHY	4	5	5	2	5	6	3	3	4	5	4	5	4	5	4	4	1
A M	2	4	5	3	5	4	3	3	2	4	2	3	3	4	2	2	1
I RAZALI	3	4	3	5	2	4	5	5	3	4	4	5	3	4	4	3	2
J A	1	4	3	2	4	5	2	2	1	6	2	2	2	4	1	2	1
CHRISTINE	2	3	4	2	5	5	5	2	3	5	3	3	3	6	3	3	1
NICHOLAS	3	3	3	4	3	5	2	4	4	5	4	5	3	4	4	4	2
Y AILYNN	2	3	5	4	5	6	5	4	5	5	3	3	3	3	2	5	2

OY ANGELA	1	3	2	3	4	4	1	1	2	4	3	1	2	5	4	3	1
OY JANINE	3	3	5	3	4	2	3	5	4	4	4	3	3	2	3	4	3
OY KATHRYN	2	3	3	1	2	4	4	3	1	4	2	4	4	4	4	2	3
IL NALEEN	1	5	2	2	1	4	3	2	3	5	2	3	4	5	3	3	1
S P	1	3	3	4	4	5	1	4	2	6	2	4	2	6	2	3	1
S MERVYN	2	4	5	3	5	5	3	4	3	5	3	5	3	5	3	3	2
VILLE LYNNE	3	3	4	2	2	5	3	3	3	5	3	3	3	5	5	3	1
OUSE JULIE	4	4	4	5	5	3	4	5	4	5	4	5	4	4	3	5	3
NSON SHELLEY	2	3	3	1	3	3	1	1	2	3	2	2	2	3	2	2	2
S RICHARD G	3	3	4	3	4	5	3	4	2	6	4	4	4	5	2	2	2
RT DAVID	2	4	1	3	1	4	1	3	3	4	2	4	1	3	3	1	1
ROA GARY																	
TEK HAI	2	1	1	2	1	3	1	1	2	4	2	2	2	2	2	2	1
SOO PING	2	5	4	4	3	5	3	5	1	5	1	5	4	5	1	1	1
HERT CHARLES	2	4	2	3	3	4	2	3	3	5	2	3	2	4	2	2	1
AS NICOLA ANNE	2	3	3	2	4	4	4	3	2	4	3	3	3	3	4	4	2
INGS JANIS	2	4	1	2	1	4	2	2	2	5	2	3	3	5	1	1	1
RICHARD	1	3	3	4	4	1	2	3	5	1	3	4	1	1	3	2	1
KINS ANDREW	3	3	3	3	4	3	3	3	3	3	3	3	2	3	3	3	3
ORD R J																	
DER HOEK CAROLYN																	
E JACKIE	3	5	3	4	1	5	3	4	2	5	3	4	3	5		3	1
H STEVEN																	
ABDULLAH WAN HASSNA																	
G W	1	4	3	2	3	3	1	2	2	4	1	2	2	3	3	3	1
WORTH MILES	3	5	3	2	4	5	2	2	2	5	2	2	3	5	3	2	1
ON A G	2	3	2	2	3	4	4	2	3	4	2	2	3	4	2	2	2
ON DAVID F	3	3	3	3	4	4	2	2	3	2	3	2	5	3	2	1	
ON GRANT	2	4	4	3	3	5	4	4	4	6	3	4	4	4	4	3	2
EY KAREN	2	2	3	2	4	2	3	2	2	2	2	2	4	3	3	3	1
KIN HUNG	3	3	4	3	4	5	4	3	5	5	2	2	4	5	2	3	1
TOH SENG	2	1	3	1	3	4	1	1	3	5	2	2	2	5	3	1	2
E P	1																
ARD D J	1	4	3	3	3	4	3	3	2	4	2	3	3	4	2	2	1
E JOAN	1																
A R	1	4	3	1	1	6	3	1	1	6	1	1	2	6	1	3	3
YEE KONG	3	4	3	3	3	5	3	3	3	4	3	3	3	4	4	3	3
IVE	3	3	5	2	3	5	3	3	3	5	3	4	4	6	5	4	4
LLAH WON	4	2	3	4	2	5	3	5	5	5	4	5	4	3	3	2	2
FUKA H	2	2	3	4	4	3	5	4	2	3	5	4	3	2	3	3	4
HARRY H	1	3	2	1	2	5	1	3	5	3	3	5	3	3	3	3	2
ES A	5	4	3	5	5	4	5	5	4	4	5	5	5	4	4	4	1
ENGLAND	3	4	3	3	4	5	2	3	4	5	4	3	4	5	4	3	1
ER SHONA	1	4	4	2	5	5	4	2	3	5	2	3	4	5	5	3	2
ERSON ROGER G	2	3	3	2	2	3	1	1	3	4	2	2	3	4	5	3	1
AN JENNIE	2	3	5	2	5	4	2	2	2	4	2	2	3	2	2	3	1
LINDA	2	3	5	3	5	6	3	3	3	6	3	3	3	5	3	4	1
MARK	3	3	3	4	3	5	2	4	3	4	3	4	3	5	4	3	1
OLD SARAH	2	5	2	1	2	4	2	1	2	5	2	2	2	5	4	2	1
ISON NIKKI	2	3	3	2	3	4	2	3	2	3	2	3	2	3	4	2	1
EY PAUL	2	4	2	3	3	4	2	3	4	4	3	3	2	4	2	3	1
OR MICHAEL	3	3	4	3	3	5	4	3	3	6	3	4	2	5	5	3	1
Y BRIDGET	2	4	3	3	4	5	3	3	3	5	2	4	3	5	4	3	2
NO NAME	3	5	3	2	3	5	2	3	2	5	1	2	2	6	4	2	1
NO NAME	3	4	3	3	3	5	3	3	2	6	4	4	3	5	3	3	2

INDIVIDUAL SCORES

QUESTIONS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
HAMID H	1	4	3	2	2	5	2	3	2	5	3	3	4	5	3	3	1
MUNIR	2	5	5	1	5	6	4	2	2	5	3	2	2	5	3	3	2
INTAN SURI	3	4	5	3	5	4	5	3	4	5	4	3	3	4	3	3	3
KI THERESA	2	5	4	5	4	5	3	5	3	5	4	5	2	5	3	2	1
LYNETTE	2	3	3	2	2	4	2	2	3	4	3	2	3	5	2	3	1
VICKI	2	3	4	4	4	5	4	4	3	6	4	4	4	5	3	2	4
D GRAHAM	2	4	3	3	3	5	3	3	3	5	3	3	3	5	4	2	1
YVONNE	3	2	3	3	4	5	2	3	3	5	2	3	2	3	2	4	3
PRISCILLA	4	3	5	3	5	3	4	3	3	4	4	4	5	4	5	4	4
HAMISH	2	3	1	2	2	3	3	2	3	5	4	2	2	4	4	3	1
CAREY	2	3	3	3	5	5	3	3	3	5	2	3	3	5	3	3	2
GLENN																	
NG T R	3	5	4	4	4	6	3	4	3	6	3	4	4	6	3	3	3
E ELIZABETH	2	3	3	3	3	4	2	4	2	4	2	3	2	3	2	2	2
KATHRYN	2	4	3	2	3	5	2	2	2	5	2	2	3	5	3	3	1
TIMOTHY	2	4	2	4	3	5	2	5	4	5	3	5	4	5	3	3	1
S MARIA	2	1	2	4	3	3	4	5	4	3	4	4	2	4	3	3	1
M J	2	4	3	4	3	5	4	4	2	5	2	5	2	4	3	2	1
ANGELA																	
ES G N																	
GRANT	2	4	3	3	3	5	3	3	4	5	3	3	3	4	3	3	2
RICHARD	2	4	3	4	3	3	2	3	3	5	3	4	3	5	3	3	1
US CHRIS	3	5	2	3	2	5	2	3	3	5	3	3	2	5	5	2	3
HAN SUSAN	3	1	3	3	3	4	2	3	2	5	3	3	2	4	4	2	2
ELVA	2	4	2	1	2	3	2	2	2	5	2	3	3	5	5	4	1
YOKE LING																	
E DAVID	3	5	2	1	2	5	1	1	2	5	2	1	3	5	4	3	1
ROBYN	4	3	5	3	5	5	4	3	3	5	3	3	4	5	5	3	1
Y P G	2	3	3	4	5	5	1	3	2	4	2	4	3	3	3	2	1
GRANT	1	2	3	3	6	4	3	5	2	4	3	4	4	4	3	2	1
GARY	2	3	5	1	2	4	2	1	1	5	2	1	4	5	5	3	1
PETER	2	4	3	2	5	5	4	3	3	6	2	3	3	5	3	3	1
DSON TANIA	3	3	4	4	3	4	3	4	3	3	3	3	4	3	4	3	2
B G																	
OND JILL	3	2	5	4	5	4	3	4	3	5	4	4	4	4	5	4	1
GRANT	2	3	2	1	3	4	2	2	3	5	2	3	2	5	2	2	1
DS K J	1	3	4	1	4	3	2	1	1	4	1	2	2	3	3	2	1
NE RICHARD																	
HARSON TANIA	2	3	3	4	3	4	3	4	2	4	3	4	3	4	3	3	1
N KAYLENE																	
BRUCE	3	3	5	5	5	3	5	5	4	4	5	5	5	4	5	4	1
BRIAN	3	5	3	4	5	6	1	3	2	6	4	4	2	6	5	2	1
B A	3	2	4	3	4	5	2	3	4	5	4	4	3	5	3	4	1
A R	2	3	3	4	3	4	3	4	4	4	2	4	3	3	3	3	2
N SHANE	3	2	3	4	4	5	1	4	2	5	2	4	3	5	5	3	3
JITESH	2	4	3	2	2	5	2	2	3	6	3	3	3	5	2	2	1
CARLITA	3	3	3	3	3	5	2	3	2	5	4	2	2	5	2	2	2
S LIONEL	2	4	3	3	4	5	3	3	2	6	4	4	4	6	3	3	1
JENNIFER																	
ANDREW	1	3	2	3	2	4	2	3	3	4	2	3	3	4	2	2	1
MICHAEL	2	5	2	4	2	5	1	4	4	6	3	4	2	5	5	2	1
STUART	2	4	4	3	5	3	4	4	3	3	3	5	3	2	4	3	2
Y CRAIG																	
OD ANNE	1	3	5	1	5	5	2	2	1	4	1	2	2	4	3	3	2
SON D R																	
SUSAN																	
N RUSSELL	2	2	3	5	5	2	4	5	3	3	4	4	4	3	3	3	1
M BEVAN	2	3	5	3	5	3	2	3	2	5	2	3	2	5	2	4	1
M B	2	4	3	3	2	5	2	3	3	5	3	3	2	5	3	2	1

NE	PHILIP M	4	3	3	4	3	4	4	2	3	2	3	2	2	2	3	2	5
NE	W J	5	4	3	5	5	5	5	5	5	5	4	5	3	4	6	3	3
	TIM H M	3	5	3	5	3	5	3	5	3	2	3	2	2	3	2	2	5
	PATRICK	1	4	5	6	5	5	1	5	5	2	6	5	1	5	3	1	2
	PAMELA R																	
	ROBIN																	
	ANTHONY J	3	6	3	6	4	6	5	6	4	3	3	5	2	3	6	4	5
	SUZANNE M																	
	R G	4	5	3	5	4	5	4	5	3	3	4	3	3	4	3	3	5
	JENNY B E	4	5	4	5	4	6	3	5	4	4	4	4	4	4			3
	KAREN E	3	4	4	4	4	4	5	4	4	2	4	4	3	4	4	3	6
TONE	KAY M	4	6	4	5	3	6	5	5	4	3	4	5	2	5	5	2	6
	B J																	
LD	BRUCE C	5	5	4	3	5	4	6	4	5	1	2	2	2	3	2	2	6
LAN	ALLAN																	
	M	4	4	4	5	4	4	5	3	3	4	3	5	2	3	4	1	6
	V	4	5	4	5	4	5	5	5	4	3	3	2	4	3	3	4	4
	ROGER G	2	1	5	4	5	3	2	4	5	1	5	6	2	5	6	2	4
	SCOTT	4	5	3	4	4	6	5	5	4	3	3	2	3	3	2	3	5
	STEVEN	4	4	3	4	3	4	3	4	3	2	2	2	2	2	3	2	6
LL	BRUCE M																	
	JEAN H L	2	4	4	6	4	5	2	6	4	2	3	4	3	3	3	2	2
SH	R J	4	4	5	6	5	5	5	4	5	3	5	4	3	4	4	3	5
	BRENT COLIN	4	3	3	5	3	5	5	6	3	2	2	4	3	3	5	2	6
AY	PAULINE A	6	4	3	5	4	6	6	6	4	1	3	4	3	3	4	2	6
	DEBBIE J	5	4	3	4	4	5	5	5	4	3	3	3	3	4	3	3	6
	CRAIG B	5	5	3	5	3	5	5	6	3	1	2	5	1	2	4	1	5
	ERICA J	5	4	3	5	3	5	5	6	3	3	4	4	3	3	3	3	5
	JAMES B	6	5	4	4	5	5	4	4	5	3	2	3	1	1	3	1	6
	A A	5	4	2	5	2	5	5	5	2	2	2	4	2	2	5	2	5
LL	DEAN A	5	3	3	3	4	3	5	3	4	1	3	4	2	3	4	2	6
	AMANDA J	5	5	4	6	4	6	5	6	4	1	3	3	1	3	3	1	6
	BLAIR	3	5	4	4	4	5	5	4	4	1	2	4	2	2	4	2	5
	BRYAN R																	
	GERARD A	6	6	2	6	2	6	6	6	2	2	2	1	2	2	3	2	6
ILL	T J	3	5	4	5	4	5	3	5	4	3	5	3	3	4	3	3	6
	ANDREW R	6	5	4	5	4	5	6	5	4	3	4	5	3	3	3	3	6
	JACQUI D																	
E	CRAIG D	5	4	1	3	2	4	5	4	2	2	2	3	2	2	3	2	6
OR	CHRIS J	5	3	3	5	3	5	5	5	3	2	3	4	2	3	4	2	5
	RICHARD	4	3	4	5	4	5	4	5	4	2	2	4	2	3	4	3	5
PS	D A																	
	PAULINE A	5	3	3	5	3	4	5	5	3	3	3	4	1	3	3	3	5
	FREDERICK JO	4	3	3	3	3	3	3	4	3	2	3	3	2	3	3	2	6
NG	M G	5	4	5	4	5	5	5	5	5	2	5	3	2	5	3	3	5
DIANNE E		5	5	5	5	5	5	6	5	5	2	4	5	2	4	5	2	6
	A AZLAN	4	5	3	5	4	6	4	6	4	3	3	4	3	3	4	3	6
	DEAN A	5	5	3	5	3	5	5	4	3	2	3	4	2	3	4	2	5
	KATHRYN M	4	4	4	6	6	6	4	6	5	1	4	3	1	4	3	1	4
	CRAIG ROBER	5	6	4	5	4	5	4	5	4	2	4	5	2	4	5	2	6
	MATTHEW W D	5	5	3	5	3	5	5	6	3	1	3	3	1	3	3	1	6
	ERIC V	3	3	3	4	4	4	3	4	3	1	3	3	1	3	3	1	4
ON	STEWART G	2	5	4	5	5	5	2	4	4	3	3	4	3	3	3	3	4
	JUDITH A	4	4	3	4	3	5	5	5	3	2	3	4	2	3	4	2	6
	TIMOTHY P	4	4	5	5	5	5	4	5	5	3	5	3	4	5	3	3	5
	A M	5	3	3	3	3	4	5	4	3	2	3	4	2	3	4	2	5
I	RAZALI	1	4	5	4	4	5	1	4	4	4	5	5	3	5	5	3	1
	J A	5	5	4	6	4	5	4	5	4	2	3	6	3	3	4	2	6
	CHRISTINE M	5	4	3	5	3	6	5	6	3	1	2	4	2	2	4	1	6
	NICHOLAS R	2	5	5	6	5	6	3	6	5	3	4	4	3	4	3	3	2
Y	AILYNN	5	5	5	5	5	6	3	5	5	2	2	2	3	3	3	3	3
Y	ANGELA	5	4	3	5	3	5	3	6	3	1	3	3	2	3	3	1	5

HOY JANINE	3	5	5	5	5	5	5	5	5	4	4	5	4	3	5	4	4
HOY KATHRYN	5	5	3	4	4	4	5	5	3	3	3	5	3	4	5	3	5
DIL NALEEN K	3	4	3	5	4	5	5	5	5	3	4	5	3	5	5	5	5
KS P	3	4	5	6	5	6	4	6	5	2	4	5	1	5	5	1	6
GS MERVYN	4	5	5	5	5	5	3	5	5	3	3	2	4	3	2	3	4
RVILLE LYNNE	5	6	4	5	5	6	5	5	5	1	4	5	2	3	4	2	6
HOUSE JULIE E	3	5	5	5	5	5	3	4	5	4	4	5	4	4	5	4	6
ENSON SHELLEY	3	3	3	3	3	3	4	3	3	2	3	4	2	3	4	2	6
S RICHARD E G	5	3	4	5	5	6	5	6	4	1	3	3	2	3	3	3	4
RT DAVID J	2	4	3	4	3	4	3	4	3	1	3	4	1	3	4	1	3
ROA GARY E																	
TEK HAI	5	2	1	3	1	4	5	2	1	2	2	2	1	1	4	1	6
SOO PING	3	4	3	4	3	4	3	4	3	1	3	4	1	3	5	1	6
HERT CHARLES A	3	3	4	6	3	6	4	6	4	2	3	4	2	3	5	2	5
AS NICOLA ANNE	4	4	3	4	3	4	4	4	4	2	3	5	3	3	5	3	6
INGS JANIS C	5	4	3	5	3	6	5	5	3	1	3	3	2	3	2	1	6
RICHARD D	3	4	5	3	5	3	3	3	5	2	4	3	2	3	1	1	5
KINS ANDREW	2	2	3	3	3	3	2	3	3	3	3	4	3	3	4	3	4
ORD R J C																	
DER HOEK CAROLYN																	
E JACKIE A	5	5	4	5	4	5	5	5	4	3	5	6	3	5	6	3	6
H STEVEN J																	
ABDULLAH WAN HASSNA																	
G W	5	4	2	5	2	5	4	5	2	1	2	3	2	1	3	1	6
WORTH MILES P	5	5	4	5	3	5	5	6	3	2	2	4	2	4	3	2	6
ON A G	3	4	2	4	5	5	3	5	5	4	3	4	3	5	4	2	5
ON DAVID FRANC	5	5	2	5	3	5	6	6	3	2	2	3	2	3	2	2	6
ON GRANT R	4	5	5	4	5	6	5	4	5	4	4	5	4	4	4	4	6
EY KAREN N	5	3	2	3	3	4	5	3	2	2	3	5	2	3	4	2	6
KIN HUNG	5	5	4	5	3	5	5	6	4	3	3	5	3	3	5	2	6
TOH SENG	4	4	4	5	3	5	6	6	3	2	1	2	2	2	3	2	5
E P H																	
ARD D J	5	4	3	4	3	4	5	5	3	2	3	3	2	3	4	2	5
E JOAN E																	
A R	5	6	4	6	4	6	5	6	4	3	4	6	3	5	4	3	6
YEE KONG	3	4	4	4	4	4	3	4	4	3	3	3	3	3	3	3	3
IVE A	2	5	5	6	5	5	2	5	4	5	5	5	5	5	5	5	4
LLAH WON	4	4	6	6	6	6	5	4	6	3	6	6	3	5	5	3	5
UKA S H	4	2	1	5	3	6	5	3	3	4	2	3	5	1	2	5	4
HARRY B H	6	3	3	3	4	3	6	3	3	3	3	4	2	2	3	2	3
S I A	3	5	4	5	5	5	3	5	5	3	5	4	3	5	4	3	3
ENGLAND	5	4	3	5	3	5	5	6	3	3	3	3	3	3	3	3	6
R SHONA	5	5	4	5	3	5	5	5	3	2	3	3	2	3	2	3	5
RSON ROGER T G	5	5	3	5	3	6	6	5	3	1	2	4	1	2	5	1	6
N JENNIE	4	3	4	4	4	4	4	4	4	1	4	5	1	5	6	1	6
INDA	3	6	3	6	4	6	4	6	4	1	3	5	3	3	4	2	5
MARK	4	4	5	5	5	5	6	6	5	1	3	4	1	3	3	3	6
LD SARAH	5	5	3	5	3	5	3	5	3	3	3	4	3	3	2	3	6
SON NIKKI	4	4	3	4	3	4	4	4	3	2	3	3	2	3	4	2	6
Y PAUL G	6	4	3	5	4	4	6	6	3	2	2	5	2	2	3	3	5
R MICHAEL	4	6	4	5	4	6	4	6	4	3	4	3	3	4	4	3	4
BRIDGET		5	4	5	4	5	3	6	4	4	4	3	4	4	3	4	4
NO NAME	5	5	3	6	5	6	5	5	4	3	5	5	3	5	4	3	6
NO NAME	5	6	4	5	4	6	6	5	4	3	5	5	3	5	5	4	6

QUESTIONS	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53
HAMID H	3	1	3	6	5	3	3	5	3	6	5	3	3	5	3	6	5
MUNIR M	4	2	3	4	3	3	3	4	4	4	4	3	3	3	4	4	4
INTAN SURI	3	1	3	5	3	2	3	3	3	6	5	3	3	4	3	6	4
KI THERESA	2	2	3	6	4	3	4	5	3	5	3	3	4	3	3	5	4
LYNETTE J	1	1	2	6	4	2	2	3	2	6	3	2	2	4	2	6	3
VICKI E	2	1	2	4	3	2	4	4	3	3	4	2	3	3	1	5	4
D GRAHAM P	3	1	3	6	4	3	3	4	3	4	4	3	3	4	3	6	4
YVONNE	4	1	3	4	4	3	3	3	3	4	5	5	3	3	3	4	3
PRISCILLA A	4	4	4	6	5	3	4	5	3	5	5	3	5	5	3	5	5
HAMISH D	2	1	2	4	2	2	3	4	3	4	3	3	3	2	3	3	2
CAREY S	3	2	3	5	3	3	3	3	3	5	3	3	3	3	3	4	3
GLENN																	
NG T R	3	3	4	4	2	3	4	2	3	4	3	4	4	2	4	4	2
E ELIZABETH M	2	1	1	6	5	2	2	4	1	5	5	1	2	5	2	5	5
KATHRYN A	2	1	2	6	5	2	1	5	1	6	5	1	2	5	1	6	5
TIMOTHY C	1	2	3	4	1	2	4	1	2	4	1	3	4	2	2	4	1
S MARIA	2	2	2	6	5	2	4	4	3	5	5	2	3	5	3	5	4
M J	3	2	1	5	5	2	3	4	2	5	4	2	3	4	2	5	4
ANGELA L																	
ES G N																	
GRANT T	3	4	3	5	3	3	3	4	3	5	3	3	4	3	3	5	3
RICHARD B	2	1	2	4	4	2	4	5	2	5	5	2	5	4	2	4	5
US CHRIS D	2	2	3	3	3	3	5	2	3	3	3	3	5	3	3	3	2
HAN SUSAN J	2	2	3	3	3	2	3	3	2	3	3	2	3	3	3	3	3
ELVA J	3	2	3	6	4	2	3	4	3	6	5	3	3	5	3	6	4
YOKE LING E																	
KE DAVID A	2	1	2	6	5	2	1	4	2	6	4	1	1	5	2	6	5
ROBYN P	4	1	4	4	4	3	3	3	3	5	5	3	3	5	3	5	3
AY P G	3	1	1	6	4	2	4	4	3	6	4	2	3	4	2	6	4
GRANT R	3	2	3	4	3	2	3	4	4	4	3	2	4	3	2	5	4
N GARY G	2	1	2	5	3	2	2	2	2	5	3	2	1	3	2	5	2
S PETER W	3	1	1	3	5	1	2	4	1	3	4	1	3	4	1	5	4
LDSON TANIA L	3	2	3	4	3	3	4	2	3	4	3	3	5	3	3	3	2
E B G																	
MOND JILL H	3	1	3	5	4	3	3	3	3	5	4	3	4	4	3	5	4
GRANT L	2	1	2	6	3	2	2	3	2	6	4	2	2	3	2	6	4
RDS K J	3	1	2	6	5	1	3	4	1	6	5	2	3	4	2	6	4
INE RICHARD G																	
UHARSON TANIA	1	1	3	5	3	3	5	4	3	5	4	3	4	4	3	5	4
ON KAYLENE A																	
E BRUCE	3	1	4	5	4	4	4	4	4	5	3	4	4	3	4	5	3
E BRIAN	2	1	2	6	4	2	3	5	2	6	5	2	3	4	2	6	2
E B A	2	2	2	5	3	2	2	3	1	5	2	2	2	3	2	5	2
Y A R	3	2	2	4	3	2	4	2	2	4	3	2	4	3	2	4	2
ON SHANE A	4	2	3	5	5	3	4	4	5	3	4	3	3	5	4	4	3
L JITESH	3	1	3	5	3	3	3	2	3	6	3	3	3	2	3	6	3
D CARLITA	4	4	3	6	5	3	2	5	3	5	5	3	2	3	3	5	5
ES LIONEL N	2	2	2	5	3	1	3	3	2	5	4	2	3	4	2	5	4
JENNIFER																	
N ANDREW D	2	1	1	6	5	1	1	3	1	6	4	1	1	5	1	6	3
MICHAEL W	2	1	1	6	2	2	4	1	1	6	1	1	4	2	1	6	2
STUART B	2	2	1	6	5	2	3	5	2	6	6	2	3	5	2	6	5
EY CRAIG A																	
OOD ANNE L	3	2	3	5	5	2	3	5	2	5	6	2	4	5	2	6	4
TSON D R																	
SUSAN J																	
EN RUSSELL G	3	2	3	5	3	3	4	2	3	6	5	3	4	3	3	6	3
AM BEVAN G	2	2	2	4	2	2	4	2	2	5	2	2	4	2	2	5	2
ES M B	2	2	2	6	2	2	3	2	2	6	2	2	3	2	2	6	2
EN L S	2	1	1	5	3	1	3	3	1	5	4	1	3	3	1	5	2
STONE PHILIP M	3	2	2	5	3	2	2	3	2	5	3	2	2	3	3	5	3

ONE	W J	3	2	3	3	4	3	3	4	3	5	4	3	4	3	3	4	4
	TIM H M	3	1	2	5	2	2	2	2	3	5	2	3	3	2	3	5	2
	PATRICK	1	1	1	4	3	1	5	3	1	4	4	1	5	2	1	4	4
	PAMELA R																	
	ROBIN																	
	ANTHONY J	5	2	2	6	5	4	4	5	2	5	5	2	4	5	2	5	5
	SUZANNE M																	
	R G	3	2	3	5	3	3	4	3	3	5	3	3	4	3	4	5	2
	JENNY B E	3	3	3	3	3	3	3	3	3	4	5	3	3	3	3	4	3
Y	KAREN E	3	1	3	6	5	3	4	4	3	6	4	3	4	4	3	6	4
STONE	KAY M	2	1	3	5	4	2	3	5	2	5	5	2	4	5	3	5	5
	B J																	
ALD	BRUCE C	2	1	2	5	3	2	4	3	2	5	2	2	3	2	2	5	3
HLAN	ALLAN																	
	M	3	1	1	6	5	2	1	5	2	6	6	3	2	5	1	6	5
IA	V	3	1	3	5	3	3	3	3	4	5	4	4	4	3	3	5	3
	ROGER G	6	1	2	4	5	1	5	3	1	5	5	2	5	5	1	5	5
	SCOTT	2	2	3	5	2	3	2	3	3	5	3	3	3	3	3	5	3
	STEVEN	3	1	2	6	3	2	2	3	2	6	2	2	2	3	2	5	2
LL	BRUCE M																	
	JEAN H L	3	1	2	4	2	2	3	3	2	3	3	1	3	3	1	3	2
SH	R J	2	1	3	5	4	3	4	4	3	5	3	3	5	3	3	5	4
	BRENT COLIN	2	2	2	6	4	2	3	4	3	5	6	3	3	5	3	5	5
AY	PAULINE A	2	1	1	6	4	1	3	2	1	6	3	3	3	4	1	6	4
	DEBBIE J	3	2	3	6	3	2	3	3	2	6	4	2	3	3	2	6	4
Y	CRAIG B	3	2	1	5	4	1	2	5	1	5	5	1	2	5	1	5	5
	ERICA J	3	1	2	6	5	2	3	4	1	5	4	1	3	4	1	5	5
	JAMES B	1	1	1	6	4	2	1	4	1	6	5	1	2	3	2	6	5
	A A	3	2	2	5	5	2	2	5	2	4	5	2	2	5	2	4	5
LL	DEAN A	3	1	2	6	4	2	3	5	2	6	4	2	4	4	2	6	5
	AMANDA J	1	1	1	6	3	1	2	5	1	6	5	1	1	3	1	6	4
	BLAIR	3	1	2	5	4	2	2	3	2	5	4	2	2	4	2	5	4
	BRYAN R					4												
	GERARD A	2	2	2	6	3	2	2	3	2	6	1	2	2	3	2	6	3
ILL	T J	2	1	3	6	2	3	4	2	3	6	3	3	4	3	3	6	2
	ANDREW R	3	1	3	6	5	3	2	4	3	6	5	3	3	4	3	6	5
1	JACQUI D					3												
NE	CRAIG D	2	1	2	6	3	2	2	3	2	6	4	2	2	4	2	6	4
NOR	CHRIS J	3	2	2	6	3	2	3	4	2	5	4	2	3	4	2	6	4
	RICHARD	2	2	2	5	5	2	5	4	2	5	5	3	2	5	2	5	5
IPS	D A																	
E	PAULINE A	3	1	3	5	3	1	3	3	3	5	3	1	3	3	1	5	3
	FREDERICK JO	4	2	2	6	3	2	2	3	2	6	3	2	3	3	2	6	3
ING	M G	3	2	2	5	3	2	4	3	2	5	3	2	4	3	2	5	3
	DIANNE E	3	1	2	6	5	2	3	4	2	6	5	2	4	5	3	6	5
T	A AZLAN	3	2	3	6	3	4	3	3	4	5	4	4	3	4	4	5	3
	DEAN A	2	2	2	5	3	2	3	3	2	5	3	2	3	4	2	5	3
	KATHRYN M	3	1	3	3	5	1	3	4	1	5	3	1	3	3	1	6	3
E	CRAIG ROBER	4	2	2	6	3	2	2	4	2	6	3	2	3	3	2	5	4
	MATTHEW W D	1	1	1	6	2	1	2	2	1	6	2	1	2	2	1	6	2
Y	ERIC V	1	1	1	4	3	1	4	3	1	3	3	1	3	3	1	3	3
SON	STEWART G	3	2	3	4	4	3	3	5	3	4	5	3	3	4	3	4	5
	JUDITH A	2	1	2	6	3	2	3	3	2	5	3	2	3	3	2	5	3
	TIMOTHY P	3	2	3	5	2	4	4	2	4	5	2	3	4	2	3	5	2
	A M	3	2	2	5	3	2	2	3	2	5	4	2	2	4	2	5	3
NI	RAZALI	2	3	3	1	5	3	5	4	3	2	5	3	5	5	3	5	4
E	J A	3	1	2	6	4	2	3	3	2	6	4	2	3	4	2	6	3
	CHRISTINE M	1	1	1	6	5	1	1	5	1	6	5	1	2	5	1	6	5
	NICHOLAS R	2	3	3	3	3	3	4	3	3	3	4	3	5	3	3	2	3
OY	AILYNN	3	1	3	4	3	2	2	3	2	4	4	3	3	4	4	4	4
OY	ANGELA	2	1	1	5	3	2	3	3	1	4	3	1	2	3	1	4	3
OY	JANINE	4	3	4	4	4	3	3	1	3	3	4	3	3	3	3	4	1

IOY KATHRYN	4	3	3	5	5	2	3	3	2	5	4	3	3	5	2	6	2
)IL NALEEN K	4	2	3	5	5	3	4	5	3	4	5	3	4	5	4	4	5
:S - P	2	1	1	6	5	1	4	4	1	5	5	1	4	5	1	5	5
;S MERVYN	2	3	3	3	2	3	3	2	3	3	2	3	3	2	3	3	2
RVILLE LYNNE	3	1	1	6	4	2	3	5	2	6	6	2	3	4	2	6	5
HOUSE JULIE E	4	2	4	6	3	4	3	2	4	5	3	4	3	3	4	5	2
ENSON SHELLEY	3	1	2	6	5	2	3	5	2	6	5	2	3	5	2	6	5
S RICHARD E G	2	2	2	6	3	2	4	4	2	5	3	2	4	3	2	5	2
RT DAVID J	1	1	1	4	4	1	3	4	1	3	4	1	3	4	1	3	4
ROA GARY E																	
TEK HAI	1	1	1	6	5	1	1	5	1	5	4	2	2	4	2	6	4
SOO PING	1	1	1	6	3	1	4	5	1	6	5	1	3	5	1	5	5
HERT CHARLES A	2	2	2	5	4	2	3	4	2	5	4	2	3	5	2	5	5
AS NICOLA ANNE	3	2	4	6	5	2	3	4	3	5	5	3	3	5	3	5	4
INGS JANIS C	3	1	1	6	2	1	3	4	1	6	3	1	3	3	1	6	3
RICHARD D	3	1	1	5	3	2	4	3	2	4	3	2	3	3	2	4	3
KINS ANDREW	4	3	3	4	5	3	3	4	3	5	4	3	3	5	3	4	4
ORD R J C																	
DER HOEK CAROLYN																	
E JACKIE A	1	3	3	6	5	3	4	5	3	6	5	1	3	5	1	6	5
H STEVEN J																	
ABDULLAH WAN HASSNA																	
G W	2	1	2	6	3	1	1	2	2	6	2	1	1	3	1	6	2
WORTH MILES P	2	1	2	6	3	2	2	4	1	6	4	2	3	5	2	6	4
ON A G	3	3	2	5	3	2	3	4	3	4	4	3	3	4	3	5	4
ON DAVID FRANC	2	1	2	6	3	2	2	4	2	6	4	2	2	2	2	6	4
ON GRANT R	4	2	3	6	4	3	3	4	3	6	4	3	3	4	3	6	4
EY KAREN N	1	1	2	6	5	1	3	4	2	6	4	2	3	5	2	6	4
KIN HUNG	5	1	4	6	4	3	1	3	3	6	5	3	2	4	3	6	3
TOH SENG	2	1	2	6	3	1	1	1	1	6	2	1	1	3	1	6	1
E P H																	
ARD D J	3	2	2	5	5	2	2	5	2	5	4	2	3	4	2	5	4
E JOAN E																	
'A R	3	1	3	6	6	3	3	6	3	6	6	3	3	5	3	6	6
YEE KONG	3	2	3	3	3	3	3	4	3	3	4	3	3	3	3	3	4
IVE A	5	4	5	3	2	3	3	3	4	4	3	3	3	3	4	3	3
ILLAH WON	5	4	4	5	5	3	5	5	3	4	6	4	5	4	4	5	5
)FUKA S H	3	2	4	3	3	1	2	3	2	5	4	3	2	2	3	6	3
HARRY B H	2	3	2	6	5	3	3	1	3	5	5	3	2	3	3	5	3
ES I A	3	2	3	3	4	3	5	4	3	5	4	3	5	4	3	5	4
ENGLAND	3	1	3	5	4	3	3	4	3	5	4	3	3	4	3	5	4
ER SHONA	3	2	3	5	2	3	3	3	3	5	3	3	3	3	3	5	3
ERSON ROGER T G	3	1	1	6	5	1	3	5	2	6	4	2	2	5	2	6	5
'AN JENNIE	2	1	1	6	5	1	2	5	1	5	5	1	2	6	1	5	5
LINDA	3	1	2	5	3	1	2	1	2	6	3	2	2	3	2	6	1
MARK	3	1	1	3	5	1	4	4	1	6	4	1	3	3	1	6	3
FOLD SARAH	4	1	4	6	2	2	2	2	2	6	2	2	2	4	2	6	2
RISON NIKKI	3	2	2	1	4	2	3	4	2	6	4	2	3	4	2	6	4
NEY PAUL G	3	1	2	5	4	2	3	5	3	5	4	2	3	3	3	5	3
LOR MICHAEL	3	1	3	4	4	3	3	4	3	4	4	3	4	4	3	4	4
DY BRIDGET	3	3	4	4	3	3	3	3	3	3	4	3	4	3	3	4	3
NO NAME	2	1	2	6	4	3	1	5	2	6	5	1	3	5	1	6	4
NO NAME	4	2	3	6	5	4	4	5	4	6	5	3	3	4	4	6	5

COGNITIVE STYLES

Question	1	2	3	4	5	6	7	8	9	10	11	12
HAMID H	2	2	1	2	1	2	1	2	2	2	1	1
MUNIR M	1	2	2	1	2	1	1	2	2	2	1	1
INTAN SURI			1	2					1		1	
KI THERESA	2	2	1	2	2	2	2	2	1	1	1	2
LYNETTE J	2	1	1	2	1	2	1	2	1	2	1	1
VICKI E	1	1	2	1	1	2	2	1	1	2	1	2
D GRAHAM P	2	1	1	1	1	2	2	2	1	2	1	2
YVONNE	2	2	2	1	2	2	2	2	2	2	2	2
PRISCILLA A	2	1	1	2	1	2	2	2	2	1	2	2
HAMISH D	2	1	1	2	2	1	2	2	2	1	1	1
CAREY S	1	2	1	2	1	2	2	2	1	2	2	1
GLENN												
NG T R	2	1	1	2	1	2	2	2	1	2	1	1
E ELIZABETH M	2	2	2	2	1	1	1	2	1	2	1	1
KATHRYN A	2	2	1	2	1	1	2	2	2	2	1	1
TIMOTHY C	2	1	1	1	1	2	2	2	1	2	2	2
S MARIA	1	1	2	2	2	1	1	2	1	2	1	1
M J	1	1	2	1	1	1	2	1	1	2	1	1
ANGELA L												
ES G N												
GRANT T	2	2	1	1	2	1	2	1	2	2	1	2
RICHARD B	1	2	1	2	1	2	1	2	1	2	1	2
US CHRIS D	1	1	2	2	1	2	1	2	2	2	1	1
HAN SUSAN J	2	2	1	1	2	1	1	2	2	1	1	1
ELVA J	2	1	2	1	1	1	1	2	1	2	1	1
YOKE LING E												
E DAVID A	2	1	1	2	1	2	2	2	2	1	1	1
ROBYN P	1	1	1	1	1	1	1	2	1	2	1	1
Y P G	1	2	1	2	2	1	2	2	2	2	1	1
GRANT R	2	2	1	2	1	2	2	2	1	2	2	1
GARY G	2	2	1	2	2	2	1	2	2	1	2	2
PETER W	1	2	2	1	1	1	2	2	2	1	2	2
LDSON TANIA L	2	1	1	2	1	2	1	2	2	2	1	1
B G												
MOND JILL H	2	1	1	2	2	1	2	2	2	2	1	1
GRANT L	2	1	1	2	1	2	2	2	2	2	1	1
RDS K J	2	1	1	2	1	2	2	2	2	2	1	1
INE RICHARD G												
UHARSON TANIA	1	1	2	1	1	1	2	2	2	2	2	1
ON KAYLENE A												
E BRUCE	2	1	1	2	1	2	2	2	2	2	1	1
E BRIAN	2	2	1	2	1	1	2	2	2	2	2	2
E B A	2	1	1	2	1	2	2	2	1	2	1	1
Y A R	2	1	1	2	1	2	2	2	1	2	1	2
ON SHANE A	2	1	2	2	1	1	2	2	1	2	1	2
L JITESH	2	2	2	2	1	1	2	2	1	2	1	2
D CARLITA	1	1	1	2	1	1	2	2	1	2	1	1
ES LIONEL N	2	1	1	2	1	1	2	2	2	1	2	2
JENNIFER												
N ANDREW D	1	1	2	1	1	1	1	2	2	2	1	2
MICHAEL W	2	2	1	2	1	2	2	2	2	2	2	1
STUART B	2	1	1	1	1	2	1	2	1	1	1	1
EY CRAIG A												
OOD ANNE L	2	2	1	2	1	1	2	2	2	2	2	2
TSON D R												
SUSAN J												
EN RUSSELL G	1	1	2	2	1	1	1	2	1	2	1	1
AM BEVAN G	1	1	1	2	2	2	2	2	1	2	1	1
S M B	2	2	1	2	1	2	1	2	2	2	1	1

L S	2	1	1	2	1	1	2	2	2	1	1	1
NE PHILIP M	2	1	1	2	1	1	2	2	1	2	2	1
NE W J	2	1	1	1	1	2	1	2	1	2	1	2
TIM H M	1	1	2	2	1	2	2	2	1	1	1	2
PATRICK	2	1	1	2	1	2	2	2	1	2	1	1
PAMELA R												
ROBIN												
ANTHONY J	2	1	1	1	1	1	2	1	1	2	2	2
SUZANNE M												
R G	2	1	1	2	2	2	2	2	1	2	1	1
JENNY B E	1	1	1	2	1	1	2	2	2	2	1	1
KAREN E	2	1	1	2	1	1	2	2	1	1	1	2
STONE KAY M	2	1	1	1	2	1	2	2	1	1	1	1
B J												
ALD BRUCE C	2	1	1	2	1	2	2	2	1	2	1	1
HLAN ALLAN												
M	1	2	2	2	1	2	1	2	2	2	1	1
V	2	1	1	1	1	2	2	2	1	2	1	2
ROGER G	2	2	1	1	2	2	1	1	1	2	1	1
SCOTT	2	2	1	2	1	2	2	2	1	2	1	1
STEVEN	1	1	2	2	1	1	1	2	1	1	2	2
LL BRUCE M												
JEAN H L	1	1	1	2	1	2	2	2	2	1	2	2
SH R J	2	2	1	2	2	2	1	2	2	2	1	1
BRENT COLIN	2	1	1	2	1	1	2	1	1	2	1	1
AY PAULINE A		2		2	1	2	2	2	2	1	2	1
DEBBIE J	2	2	1	2	2	2	1	2	2	1	2	1
Y CRAIG B	2	1	2	1	1	1	2	2	1	2	2	2
ERICA J	1	1	2	2	1	1	2	1	1	2	1	1
JAMES B	1	1	2	2	1	1	2	2	2	2	1	2
A A	1	1	2	2	1	2	2	2	1	2	1	1
LL DEAN A	2	1	1	2	1	1	1	2	1	2	1	1
AMANDA J	2	1	2	2	1	2	1	2	2	1	2	2
BLAIR	2	2	1	2	1	1	1	2	1	1	1	1
BRYAN R												
GERARD A	2	1	1	2	2	1	2	2	1	2	1	1
ILL T J	1	2	2	2	1	2	1	2	1	2	1	2
ANDREW R	2	2	1	2	1	1	2	2	2	2	1	1
1 JACQUI D												
NE CRAIG D	1	1	2	2	1	1	1	2	2	1	1	1
NOR CHRIS J	2	1	2	2	1	2	1	2	1	2	1	1
RICHARD	2	2	1	2	1	2	2	1	1	1	2	2
IPS D A												
E PAULINE A	2	2	1	2	1	2	2	2	1	2	1	1
FREDERICK JO	1	2	1	2	1	2	2	2	1	2	1	2
ING M G	1	1	2	2	1	1	1	2	1	1	2	2
DIANNE E	2	1	1	2	1	1	1	2	2	2	1	1
T A AZLAN	2	1	1	2	1	2	2	2	1	1	2	2
DEAN A	2	1	2	2	2	1	2	2	1	2	1	2
KATHRYN M	2	1	2	2	1	2	2	2	1	2	1	1
E CRAIG ROBER	2	2	2	1	2	2	2	2	1	1	1	2
MATTHEW W D	2	1	1	2	1	2	2	2	2	2	1	1
Y ERIC V	2	2	1	2	1	2	2	2	1	2	1	1
SON STEWART G	2	2	1	1	1	2	1	2	2	2	1	1
JUDITH A	2	1	1	2	1	2	2	2	2	2	1	1
TIMOTHY P	2	1	2	1	1	1	1	2	1	1	2	1
A M	2	2	1	1	1	1	1	2	2	1	1	2
NI RAZALI												
E J A	2	2	1	2	2	2	2	2	2	1	2	2
CHRISTINE M	2	1	1	2	1	2	2	2	1	2	1	2
NICHOLAS R	1	1	2	2	1	2	2	1	2	1	2	2
OY AILYNN	2	1	1	2	1	1	2	2	2	2	2	2

HOY ANGELA			1		2				2			2
HOY JANINE	2	2	1	1	1	1	1	1	2	2	2	2
HOY KATHRYN	2	1	2	2	2	1	2	2	2	2	2	2
OIL NALEEN K	2	1	1	1	1	1	2	2	1	1	2	1
KS P	2	1	1	2	1	1	1	2	1	2	2	2
GS MERVYN	2	1	2	1	2	1	2	2	1	2	1	1
RVILLE LYNNE	2	1	1	2	1	2	1	2	2	2	1	2
HOUSE JULIE E	2	1	1	2	2	2	1	1	1	1	1	2
ENSON SHELLEY	1	1	2	1	2	1	1	2	2	1	2	1
S RICHARD E G	2	2	1	1	1	1	1	2	2	2	1	2
RT DAVID J	2	1	2	2	2	1	2	2	2	2	1	1
ROA GARY E												
TEK HAI	1	1	2	2	2	1	2	2	2	2	2	2
SOO PING	2	1	1	2	1	2	2	2	1	1	2	1
HERT CHARLES A	2	1	1	2	1	1	1	2	2	1	2	2
AS NICOLA ANNE	2	1	1	2	1	1	1	2	2	2	1	2
INGS JANIS C	2	1	1	2	2	1	1	2	2	2	1	1
RICHARD D	2	1	1	2	1	1	2	2	2	2	2	2
KINS ANDREW	1	1	1	2	1	1	2	2	2	2	1	1
ORD R J C												
DER HOEK CAROLYN												
E JACKIE A	2	2	1	1	1	2	2	1	1	2	1	1
H STEVEN J												
ABDULLAH WAN HASSNA												
G W	2	1	1	2	2	1	2	2	1	1	2	2
WORTH MILES P	2	1	1	2	2	1	2	2	2	2	1	2
ON A G	2	2	2	2	2	1	1	2	2	2	2	1
ON DAVID FRANC	2	1	1	2	1	2	1	2	2	2	1	1
ON GRANT R	2	2	1	1	1	2	2	2	1	2	2	1
EY KAREN N	2	1	1	2	1	1	1	2	2	2	2	1
KIN HUNG	2	2	1	2	2	1	2	2	1	2	1	1
TOH SENG	2	1	1	1	1	2	2	1	1	2	1	2
E P H												
ARD D J	2	2	1	1	1	1	2	1	1	2	1	1
E JOAN E												
A R	2	1	1	1	2	2	1	2	1	2	2	2
YEE KONG	2	1	1	2	1	2	2	2	2	2	1	1
IVE A	2	2	1	2	2	2	2	2	2	2	1	1
LLAH WON	2	2	2	2	1	1	1	2	1	2	1	1
FUKA S H	2	2	1	2	1	1	2	2	1	1	2	2
HARRY B H	2	2	2	2	2	2	2	2	1	2	2	2
ES I A	2	1	1	2	2	1	2	2	1	2	2	1
ENGLAND	2	2	2	2	1	1	2	2	1	2	1	2
ER SHONA	2	2	1	2	1	1	1	2	2	2	2	2
ERSON ROGER T G	2	2	1	2	1	1	1	2	2	2	2	1
AN JENNIE	1	1	2	2	1	2	1	2	1	2	2	2
LINDA	2	1	2	2	1	2	2	2	2	2	1	1
MARK	2	1	1	2	1	2	1	2	2	1	2	2
OLD SARAH	2	2	1	2	2	1	1	2	2	2	1	1
ISON NIKKI	2	2	1	1	1	2	2	2	1	2	1	2
EY PAUL G	1	2	2	2	1	1	2	2	2	2	1	1
OR MICHAEL	2	2	1	2	1	1	2	2	1	2	2	1
Y BRIDGET	2	1	1	2	2	2	2	2	2	2	1	1
NO NAME	2	1	1	2	1	1	2	2	2	2	1	1
NO NAME	2	1	2	2	1	2	2	2	2	2	1	2

Questions	13	14	15	16	17	18	19	20	21	22	23	24
HAMID H	2	1	2	2	2	1	2	1	2	1	1	1
MUNIR M	2	1	1	2	2	1	2	2	2	2	2	2
INTAN SURI			1			1	2	2	2			2
KI THERESA	2	1	1	2	2	1	2	1	2	2	2	1
LYNETTE J	2	1	2	1	1	2	1	2	1	2	2	2
VICKI E	2	1	1	2	2	1	1	2	1	1	2	2
D GRAHAM P	1	1	1	2	2	1	2	1	2	1	1	2
YVONNE	1	2	2	2	1	2	2	2	2	2	2	2
PRISCILLA A	2	1	2	2	2	2	2	2	2	2	2	2
HAMISH D	2	1	2	2	2	1	2	2	2	2	2	2
CAREY S	2	1	2	1	1	2	1	2	2	2	2	2
GLENN												
NG T R	2	1	2	1	1	2	2	2	2			
E ELIZABETH M	2	1	2	2	2	2	2	2	2	2	2	2
KATHRYN A	1	1	1	2	2	1	1	2	1	1	2	1
TIMOTHY C	1	2	2	2	2	1	1	1	1	2	1	2
S MARIA	2	1	2	2	2	1	1	2	1	1	2	2
M J	1	1	1	2	2	1	1	2	2	1	1	1
ANGELA L												
ES G N												
GRANT T	2	1	2	2	2	1	2	2	2	1	2	1
RICHARD B	2	1	2	2		1	2	1	1	1	1	1
US CHRIS D	2	1	2	1	2	2	2	2	1	2	2	2
HAN SUSAN J	1	2	1	1	1	2	2	1	1	2	2	1
ELVA J	2	2	2	2	2	2	1	2	1	2	2	2
YOKE LING E												
E DAVID A	1	1	1	2	2	1	1	2	2	2	2	1
ROBYN P	2	1	2	2	2	1	2	2	1	1	2	1
Y P G	2	1	2	2	2	1	2	2	1	2	1	2
GRANT R	1	1	2	2	2	1	1	1	2	2	2	2
GARY G	2	1	2	1	1	2	1	2	2	2	2	2
PETER W	2	2	2	2	2	1	1	2	2	2	2	1
DSON TANIA L	2	1	2	2	2	1	1	2	1	2	1	2
B G												
OND JILL H	2	1	2	2	2	1	1	2	1	1	2	1
GRANT L	2	1	2	2	2	1	1	2	2	1	2	1
RDS K J	2	2	2	1	1	2	1	2	2	1	1	2
INE RICHARD G												
HARSON TANIA	2	1	2	1	1	2	2	2	1	1	1	2
ON KAYLENE A												
E BRUCE	1	1	1	2	2	1	1	1	2	2	2	1
E BRIAN	2	1	2	2	2	2	2	2	1	1	2	1
E B A	2	1	2	2	2	1	1	2	2	1	2	1
Y A R	1	2	2	1	1	2	1	1	1	1	2	1
ON SHANE A	2	1	2	1	1	2	2	2	2	2	2	2
L JITESH	1	1	1	2	2	2	2	2	2	2	2	1
D CARLITA	1	1	1	2	2	1	2	2	1	1	2	1
ES LIONEL N	1	1	2	2	2	2	1	1	2	1	2	1
JENNIFER												
N ANDREW D	1	2	1	2	2	2	1	1	2	1	2	1
MICHAEL W	1	1	2	2	2	2	2	2	1	2	1	1
STUART B	1	1	2	2	2	1	1	2	2	1	2	1
EY CRAIG A												
OOD ANNE L	2	1	2	2	2	1	2	2	1	1	2	2
TSON D R												
SUSAN J												
EN RUSSELL G	2	1	2	2	2	1	1	2	2	1	2	1
AM BEVAN G	2	1	2	2	2	1	2	1	2	1	1	2
S M B	2	1	2	2	2	1	2	2	2	2	2	2
EN L S	1	1	1	2	1	1	2	2	2	1	2	2

)NE PHILIP M	2	1	2	1	1	2	2	2	2	2	1	2
)NE W J	2	1	2	2	2	2	2	1	1	1	2	2
TIM H M	2	2	2	2	2	1	1	2	2	2	2	2
PATRICK	2	2	2	1	1	2	2	1	2	2	1	2
PAMELA R												
ROBIN												
ANTHONY J	1	1	1	2	2	2	1	2	1	1	2	2
SUZANNE M												
R G	2	1	2	2	2	1	2	2	1	2	2	2
JENNY B E	1	1	2	2	2	1	1	1	2	1	2	1
(KAREN E	2	1	2	2	2	1	1	2	1	1	2	1
STONE KAY M	1	2	1	1	2	1	1	1	2	2	2	1
B J												
ALD BRUCE C	1	1	1	1	1	2	2	2	2	2	1	2
HLAN ALLAN												
M	1	2	1	2	2	2	2	1	2	2	2	1
A V	2	1	2	2	2	1	1	1	1	2	1	1
ROGER G	2	1	2	2	2	1	1	2	1	2	2	1
SCOTT	2	1	2	2	2	1	2	2	2	2	2	2
STEVEN	1	1	1	2	2	1	1	2	2	2	2	2
LL BRUCE M												
JEAN H L	2	1	2	2	2	1	1	2	2	1	2	1
SH R J	1	1	1	2	2	1	1	2	2	2	2	2
BRENT COLIN	2	1	2	2	2	1	1	2	2	2	1	2
AY PAULINE A	2	1	2	1	1	2	1	2	2	2	1	2
DEBBIE J	2	1	2	2	2	1	2	2	2	2	1	2
Y CRAIG B	1	1	1	2	2	1	2	1	2	2	2	1
ERICA J	2	1	2	2	2	2	1	2	1	1	2	2
JAMES B	2	1	2	2	2	2	2	2	2	2	2	1
A A	1	1	1	2	2	2	1	1	2	1	2	1
LL DEAN A	1	1	2	2	1	2	1	2	1	2	2	1
AMANDA J	1	1	1	2	1	2	1	2	2	2	2	2
BLAIR	2	2	2	2	2	1	1	2	2	1	2	1
BRYAN R												
GERARD A	2	1	2	2	2	1	2	2	2	2	2	2
ILL T J	1	1	1	2	2	1	1	1	2	1	2	2
ANDREW R	2	1	2	1	1	2	1	1	2	2	2	2
JACQUI D												
E CRAIG D	1	1	1	2	2	1	1	1	2	1	2	1
OR CHRIS J	1	1	2	2	2	1	1	1	1	2	1	2
RICHARD	2	1	2	2	2	1	2	2	1	2	1	1
PS D A												
PAULINE A	2	1	2	1	1	1	1	2	2	1	2	2
FREDERICK JO	2	1	2	2	2	1	1	2	2	1	2	1
NG M G	1	1	2	2	2	1	1	2	2	1	2	1
DIANNE E	2	1	1	1	2	2	1	2	1	2	2	1
A AZLAN	1	1	1	2	2	1	1	1	2	2	2	1
DEAN A	1	1	2	2	2	1	1	2	2	1	2	2
KATHRYN M	2	2	2	2	2	1	1	1	1	1	1	1
CRAIG ROBER	1	2	1	2	2	1	1	2	1	2	1	2
MATTHEW W D	2	2	2	2	1	1	2	2	2	2	2	1
ERIC V	1	1	1	2	2	1	1	2	2	1	2	1
ON STEWART G	2	1	2	1	1	2	1	2	2	2	1	2
JUDITH A	1	1	1	2	2	1	1	1	2	2	2	2
TIMOTHY P	2	1	2	2	2	1	1	2	1	1	2	2
A M	2	1	2	1	1	1	1	1	1	2	2	1
II RAZALI												
J A	1	1	1	1	1	2	1	2	1	2	1	2
CHRISTINE M	2	1	2	2	1	1	1	2	1	1	2	2
NICHOLAS R	2	1	2	2	2	1	1	2	2	2	1	2
)Y AILYNN	1	1	1	2	2	1	2	1	2	1	2	2
)Y ANGELA		1			1		1	1	2		2	

HOY JANINE	2	1	2	2	1	2	1	1	1	1	2	1
HOY KATHRYN	1	1	1	2	2	1	1	1	2	1	2	2
DIL NALEEN K	1	1	1	2	2	2	2	1	2	1	2	1
KS P	1	1	1	2	2	1	1	2	1	2	2	2
GS MERVYN	2	2	2	2	2	1	1	1	2	1	2	2
RVILLE LYNNE	1	1	2	2	2	1	2	2	1	1	1	1
HOUSE JULIE E	1	1	2	2	2	1	1	2	2	2	1	2
ENSON SHELLEY	2	1	2	1	1	2	2	2	2	2	1	2
S RICHARD E G	1	2	2	2	2	2	2	2	2	1	2	1
RT DAVID J	1	1	2	2	1	2	2	2	1	1	2	1
ROA GARY E												
TEK HAI	1	1	2	2	2	1	2	2	1	1	1	1
SOO PING	1	1	1	2	2	1	1	1	1	1	2	2
HERT CHARLES A	1	1	1	2	2	1	2	1	2	1	2	1
AS NICOLA ANNE	1	2	1	2	2	2	1	2	2	1	2	2
INGS JANIS C	2	1	2	2	2	1	1	2	1	1	2	1
RICHARD D	2	1	1	2	1	2	1	2	1	2	2	2
KINS ANDREW	2	1	2	2	2	2	1	1	2	2	1	2
ORD R J C												
DER HOEK CAROLYN												
E JACKIE A	2	1	2	2	2	1	1	2	1	1	2	2
H STEVEN J												
ABDULLAH WAN HASSNA												
G W	1	1	2	2	2	2	2	2	1	2	1	2
WORTH MILES P	1	1	1	1	1	2	1	2	1	1	2	2
ON A G	2	2	2	2	1	2	2	2	2	1	2	2
ON DAVID FRANC	2	1	2	2	2	1	1	2	2	2	2	2
ON GRANT R	2	1	2	2	2	1	1	2	2	2	1	2
EY KAREN N	1	2	1	2	2	1	2	2	2	1	2	1
KIN HUNG	1	1	1	2	2	1	2	2	2	2	2	1
TOH SENG	1	1	1	2	2	1	1	1	1	2	2	2
E P H												
ARD D J	2	1	2	1	1	2	2	2	2	1	2	1
E JOAN E												
A R	1	1	2	2	2	1	2	2	1	2	2	1
YEE KONG	2	1	1	2	2	1	2	1	1	1	2	1
IVE A	1	1	1	2	2	1	2	2	1	1	2	2
LLAH WON	2	1	2	2	2	1	1	1	2	2	2	2
FUKA S H	1	2	1	1	2	2	1	2	1	2	2	1
HARRY B H	1	1	2	2	2	2	1	1	2	2	2	2
ES I A	2	1	2	2	2	2	2	2	2	1	2	1
ENGLAND	2	1	2	2	2	1	1	2	2	2	2	2
ER SHONA	2	2	1	2	1	1	1	1	1	1	1	1
ERSON ROGER T G	1	1	2	2	2	1	2	2	2	2	2	1
AN JENNIE	1	1	1	2	2	2	1	1	1	2	2	2
LINDA	1	1	1	2	2	2	2	1	2	1	1	1
MARK	2	1	2	2	2	1	2	1	1	2	2	1
OLD SARAH	2	1	2	1	1	2	1	2	2	2	2	2
ISON NIKKI	2	1	2	2	2	1	1	2	2	2	2	2
EY PAUL G	1	1	2	1	2	1	2	1	2	1	2	1
OR MICHAEL	2	1	2	2	2	1	2	2	2	2	2	2
Y BRIDGET	1	2	2	1	1	2	2	2	2	2	1	2
NO NAME	2	1	2	2	2	1	2	2	1	2	2	1
NO NAME	2	1	2	2	1	1	1	1	1	2	1	2

INDIVIDUAL ACCUMULATED SCORES

	Size	Ability	Team	Interpersonal Orientations EI	WI	EC	WC	EA	WA	Cognitive Style P	S
T. H.	4	56	2	6	9	1	7	8	9	50	50
I.S.	4	68	2	1	2	3	4	2	5	33	67
B M.	4	53	2	6	6	0	4	3	7	67	75
N A. A.	4	56	2	3	7	0	2	8	6	92	83
B.	4	78	4	1	0	3	7	2	5	67	83
R G	4	61	4	1	0	6	1	3	5	67	33
G W	4	54	4	6	7	7	3	8	9	33	25
Y K N	4	77	4	5	8	0	8	7	5	42	83
A M	4	73	5	3	7	2	5	3	6	17	42
E C R.	4	75	5	6	7	2	2	5	5	42	58
R D	4	77	5	4	8	6	8	1	3	42	33
ORTH M P	4	65	5	5	7	2	0	5	6	42	42
OUSE J E	4	62	6	1	0	4	2	0	5	50	50
L J	4	80	6	3	8	5	2	5	8	67	17
GSTONE K M	4	64	6	4	5	1	0	5	5	42	83
N R	4	66	6	3	0	4	1	1	0	67	42
T P	4	65	7	0	0	9	1	4	5	42	50
S N A	4	79	7	4	2	0	4	4	5	42	75
C M	4	63	7	2	9	0	1	5	9	67	42
ND J H	4	65	7	1	0	2	3	1	5	50	58
S I A	3	73	8	1	0	1	2	1	3	50	50
R E G	3	75	8	4	6	6	3	3	4	25	67
R P	3	51	8	0	0	2	3	3	3	58	50
J A	4	75	10	6	7	3	3	3	5	67	75
NE C D	4	57	10	4	7	4	4	8	8	58	92
N D F.	4	64	10	6	7	5	3	5	7	58	50
S L N	4	50	10	4	7	2	1	3	5	33	75
NSON S	4	79	13	6	7	0	9	4	5	33	8
K M	4	64	13	6	7	3	1	3	3	83	67
B C	4	71	13	6	3	1	3	4	6	75	42
V E	4	47	13	3	6	2	1	1	2	83	58
E E J	4	47	15	5	4	1	2	3	5	92	42
T H M	4	69	15	5	4	9	3	1	5	75	58
E E M	4	65	15	6	8	0	5	3	6	58	33
N A G	4	57	15	4	2	1	3	4	3	33	42
J A	2	53	17	5	3	0	0	3	4	67	50
NG M G	2	74	17	4	6	5	4	3	5	50	75
ILL T J	4	56	18	3	0	7	1	1	5	67	83
P	4	88	18	5	9	5	2	1	1	75	25
P G	4	77	18	4	4	2	3	3	7	67	67
R	4	82	18	4	5	0	4	3	7	50	33
M	3	85	19	1	0	9	1	2	0	58	75
AN S J	3	57	19	5	6	4	4	3	2	17	50
ILLE L	3	61	19	3	8	1	1	4	5	50	50
P A	1	77	21	5	4	4	6	3	5	67	42
J H L	4	46	24	3	6	6	1	1	1	50	67
M J	4	74	24	6	8	2	1	1	5	83	75
A J	4	81	24	5	9	3	1	3	6	42	50
C	4	77	24	5	0	0	2	3	6	75	67
LL D A	4	65	25	5	7	1	9	3	5	58	42
M B	4	93	25	4	7	9	1	3	5	50	42
S	4	64	25	6	7	7	3	2	8	50	67
GS J C	4	68	25	7	8	5	2	5	5	42	58
D S	4	85	26	3	0	3	2	3	5	58	50
P G	4	75	26	4	7	3	2	3	7	50	25
D E	4	67	26	5	6	0	1	3	5	50	42
Y C B	4	77	26	3	8	1	1	3	8	50	75
D A	4	83	27	5	7	0	1	8	9	58	75

	4	86	27	1	6	4	1	2	6	75	67
S	4	63	27	6	0	7	2	5	5	67	42
R G	4	67	27	1	7	1	7	0	3	50	50
H H	3	39	28	4	0	0	1	4	5	50	58
J	3	33	28	2	0	3	3	1	0	25	50
B	3	68	28	4	0	4	1	1	0	58	25
A A	4	60	29	3	0	2	1	3	5	50	83
T	4	65	29	4	0	4	2	2	5	42	67
R	4	67	29	3	0	0	3	1	1		
S	4	57	29	6	4	6	1	3	6	33	25
R B	4	51	30	3	7	1	3	2	2	58	42
D A	4	52	30	4	7	3	1	3	5	58	67
T R	4	87	30	3	0	9	0	2	0	75	33
A	4	79	30	2	0	3	1	1	0	50	58
E V	3	57	31	4	9	5	7	2	1	67	83
S H	3	30	31	4	2	5	7	3	6	33	58
A D	3	46	31	4	7	1	5	1	9	50	92
T	4	80	33	4	1	1	3	3	5	58	8
S	4	54	33	3	2	6	1	5	5	25	67
P M	4	54	33	3	6	6	8	5	7	58	8
B G	4	73	33	4	7	9	2	3	4	75	50
T C	3	74	34	3	7	9	1	1	1	50	58
D J	3	57	34	6	9	1	4	1	1	58	42
G R	3	63	34	3	0	1	2	3	5	50	42
G L	4	58	35	5	7	4	2	5	6	67	67
W	4	44	35	2	0	0	3	3	3	58	58
P A	4	50	35	0	0	0	2	1	4	42	33
C S	4	79	35	3	1	5	2	1	4	67	25
L S	3	64	38	7	8	5	6	3	5	50	58
A L	3	54	38	4	4	0	2	8	5	33	42
N	3	73	39	6	7	2	5	4	4	50	50
P	3	59	39	6	8	0	1	2	5	42	58
B A	3	69	39	3	7	6	2	3	7	75	67
S B	2	61	41	2	8	0	8	2	5	50	75
K J	2	88	41	6	6	0	3	3	5	67	33
J	3	65	43	3	8	0	6	5	6	67	58
P A	3	62	43	1	6	3	0	4	5	50	17
B	3	67	43	4	7	5	0	3	5	33	42
A R	1	59	47	4	7	6	7	3	1	67	58

	SIZE	RCI	RCC	RCA	OCI	OCC	OCA	ICI	ICC	ICA	TEAM
I S	4										2
T H	4										2
A A	4										2
M	4	4	4.25	3.5	-3.5	-4.25	-1	4.42	2.38	3.81	2
K N	4										4
B	4										4
R G	4										4
G W	4	6	3.25	6	-1.5	3.25	-2	6	1.3	3.94	4
R D	4										5
RTH M P	4										5
C R	4										5
A M	4	3.75	7.25	2	-3.75	-2.75	-2	1.09	4.55	2.69	5
USE J	4										6
N R	4										6
L J	4										6
STONE K M	4	3	5.25	4.25	-0.5	5.25	-3.25	4.12	2.28	4.6	6
N A	4										7
ND J H	4										7
T P	4										7
C M	4	1.5	8.5	6.5	1	8.5	-6.5	4.39	3.24	2.87	7
L N	4										10
J A	4										10
D F	4										10
E C D	4	2	2.75	5	-3	2.75	-1.5	1	2.05	3.32	10
K M	4										13
V E	4										13
SON S M	4										13
B C	4	1	1	2.5	-0.5	0	-2.5	2	2.35	2.74	13
E M	4										15
E J	4										15
A G	4										15
T H M	4	4.5	6	1	-1.5	5.5	-1	2.87	3.54	1.12	15
P	4										18
PG	4										18
R	4										18
ILL T J	4	5.5	7	7	-4.5	7	-7	3.91	1.58	3.32	18
C	4										24
A J	4										24
M J	4										24
J H L	4	3.5	6.5	5.5	-3	6.5	-5.5	3.77	1.87	2.87	24
S	4										25
M B	4										25
GS J	4										25
LL D A	4	2.75	9.75	2.5	-2.75	9.75	-2.5	1.48	1.3	1	25
D SARA	4										26
P G	4										26
D E	4										26
Y C B	4	2.5	1.75	6.5	-2.5	1.25	-6.5	3.46	1.79	1.3	26
NDA	4										27
D A	4										27
S	4										27
R G	4	4.25	5.25	7.5	4.25	5.25	-3	2.28	3.11	5.02	27
I R	4										29
A A	4										29
I T	4										29
D S	4	5	6.25	4.51	5	6.25	-4.5	2.92	1.79	2.69	29
G T R	4										30
D A	4										30
R B	4										30
E A	4	4.5	11.75	4.25	-3.5	11.75	-1.75	4.03	2.17	2.68	30

ONE P M	4											33
B G	4											33
S	4											33
ARSON T	4	2.5	9	2.25	2.5	9	-2.25	2.6	3.81	1.92		33
C S	4											35
P A	4											35
G L	4											35
AH W	4	7.5	3	4.25	-1.5	3	-2.75	4.56	2.06	2.49		35
R P	3											8
R E G	3											8
I A	3	6.33	3.333	1.5	-2.33	3.333	-1.5	4.5	2.49	1.25		8
ILLE L	3											19
M	3											19
AN S J	3	3.33	10.66	3.66	-2.66	10.66	-0.33	4.71	3.4	2.87		19
B	3											28
H H	3											28
Y J	3	7.33	3.666	5.33	7.333	3.666	-0.66	0.94	2.16	3.77		28
A D	3											31
E V	3											31
KA S H	3	4	4.666	6.33	-4	-4.66	-6.33	2.94	2.83	3.09		31
D J	3											34
T C	3											34
G R	3	5.66	9.333	4	-4.33	9.333	-2.66	4.92	2.94	2.83		34
P	3											39
ON N	3											39
B A	3	3.83	4	2.33	-3.83	4	-2.33	1.7	3.09	1.25		39
AY P A	3											43
B	3											43
J	3	7.33	5.666	2.33	-7.33	5.666	-2.33	1.89	1.25	1.25		43
J A	2											17
NG M G	2	4	9	3	-3	1	-3	4	9	1		17
D A L	2											38
L S	2	7	9	5	-5	-3	1	7	9	5		38
S B	2											41
S K J	2	6	11	5	-8	-11	-5	6	5	1		41
E P A	1											21
A R	1											47

FORECAST ERRORS

TEAM	F1	F2	F3
2	10.9%	10.3%	12.0%
4	10.3%	10.9%	10.5%
5	10.5%	8.5%	12.4%
6	9.9%	9.0%	6.5%
7	5.5%	4.3%	3.3%
8	18.5%	16.8%	11.4%
10	10.5%	6.2%	4.6%
13	4.0%	6.0%	7.5%
15	6.8%	7.8%	7.8%
17	8.3%	10.2%	7.1%
18	5.8%	7.4%	5.5%
19	10.1%	9.5%	9.3%
24	19.6%	12.8%	11.2%
25	4.8%	2.6%	1.9%
26	15.9%	18.0%	12.1%
27	22.5%	15.3%	12.9%
28	30.0%	30.0%	17.1%
29	14.9%	15.0%	12.9%
30	9.2%	8.5%	6.1%
31	1.0%	5.7%	4.3%
33	17.1%	10.6%	12.1%
34	9.6%	6.5%	4.6%
35	8.0%	5.7%	6.4%
38	23.4%	13.1%	9.7%
39	12.6%	10.3%	9.6%
41	12.6%	10.3%	9.6%
43	2.9%	6.7%	9.8%