THE IN BASKET TEST AS

PRACTICAL PSYCHOLOGY

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ABSTRACT

The aim of this thesis is to demonstrate the value of the in basket test as practical psychology. Practical psychology is defined as applied psychology that is used by practitioners. In the case of personnel selection the practitioners are those who select people for work; this includes a large number and a wide variety of people.

For the in basket test to be regarded as practical psychology it was hypothesised that a single variable method of overall assessment of performance on the in basket test should be as good as a multivariate method; the in basket test should be reliable; the single variable approach should be a valid method of assessing performance on the test; and the validity of the in basket test should be demonstrated in an industrial setting. Four studies were conducted to test these hypotheses; a reliability study, a factor analytic study, an assessment of the validity of the in basket test using discriminant analysis, and a study of the test in a meat freezing works.

It was concluded that the single variable method of overall assessment of performance on the in basket test was as good as the multivariate method. It was argued that there were inherent difficulties in establishing the reliability of the in basket test, but inter scorer reliability was demonstrated. It was shown that the single variable of overall assessment on the in basket test was valid. The study conducted in a meat freezing works showed that the in basket could be used validly in an industrial setting.

As a result of the research and a review of other personnel selection

methods and their relationship to practical psychology, it was concluded that work sample tests need to be promoted more by psychologists as useful selection methods in industry.

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CHAPTER 1

INTRODUCTION

1.1 An Overview

After some study it would be apparent to anyone interested in the selection of people for work that there is a considerable discrepancy between the methods the literature advocates and what is actually used by practitioners in industry. The discrepancy has a number of causes, perhaps most important of which is that most practitioners are not psychologists and for this reason are often unaware of the poor validity of some popular selection techniques. They also do not have the background or the technical sophistication to use some of the more promising ones. The result is that face validity plays an important part in the choice of a selection method by a practitioner.

Work sample tests have high face validity but are comparatively infrequently used for selection, particularly management selection. The main purpose of research in this thesis is to obtain further psychometric data on the in basket test, which is a form of work sample test, so that its use by practitioners can be encouraged with confidence. The second chapter of this work presents a theoretical argument for separating applied psychology and a form of psychology called practical psychology. The latter is distinguished by its validity, its ease of comprehension, and its implementation by non-psychologists; while applied psychology may be valid, but is not implemented because of its lack of appeal or its technical complexity. An overview of general findings associated with the selection methods used in industry is then presented to justify the contention that the work sample test is the only selection technique which fulfils or has the potential to fulfil the requirements of practical psychology. A justification for the increased use of work sample tests is presented because they are not only psychometrically sound and relatively simple to design and use, but they also have high face validity and robustness which is so important if practitioners are to be convinced to use more valid selection methods.

The overview of selection methods deals in turn with selection interviewing, references, and application forms, which are the subject matter of chapter three; and the many forms of psychometric tests, and assessment centres, which are the subject matter of chapter four. Chapter five develops an argument for work sample tests being part of practical psychology and attempts to show why the other methods fail in various ways to fulfil the requirements of this new psychology.

As a result of a review of the work sample test literature an argument is presented for further research on the in basket test because of its infrequent use for selection in industry and the many psychometric issues still left unresolved, which are important to answer for the technique to be regarded as practical psychology.

Chapter six discusses the unique nature of personnel decisions and how this influenced the selection of discriminant analysis to answer a major question posed in the work: whether a complex multivariate approach is superior to a simple univariate approach in the assessment of people on the in basket test. Chapter seven describes the main aims of the research which includes the univariate/multivariate comparison, the value of factor analysis in relation to the in basket test, and the reason for conducting a separate study of the in basket test in the freezing industry. Chapter seven also gives details of the sample and the method of testing.

Chapter eight deals with the design of the Plasto in basket test and the scoring procedures used. Chapter nine considers the reliability of the in basket test and discusses the relevance of reliability checks to work sample tests in general and the Plasto in basket test in particular. Chapter ten provides a rationale for the factor analyses conducted and also provides an overview of past attempts at factor analyses of in basket tests. The chapter also presents the results of the four factor analyses undertaken in the study.

Chapter eleven presents a rationale for the discriminant analyses planned at the beginning of the study and describes the various stepwise procedures used and then the results of these discriminant analyses.

Chapter twelve describes the freezing works study, gives a rationale for its necessity, and presents a description of the Dollrier in basket test together with a discussion of the validity study conducted using the test.

Chapter thirteen summarises the results of all four parts of the research; the reliability study; the factor analyses; the discriminant analyses; and the freezing works study. The final chapter concludes by suggesting that one of the important considerations for psychologists is to induce change. Some methods for achieving this are suggested.

Chapter 2

PSYCHOLOGY, APPLIED PSYCHOLOGY AND PRACTICAL PSYCHOLOGY

2.1 Defining Psychology

Defining psychology is not a very fruitful exercise. Miller (1964) describes leaving an assistant to take over an introductory psychology course for a short period. The assistant decided to open his series of lectures by defining his subject. When Miller returned to teach the class two weeks later he found the assistant still struggling to define psychology.

Definitions have been as different as Hebb's (1949) "psychology is then defined as the study of the more complex forms of integration and organisation"; Zangwill's (1950) "psychology is that aspect of biology concerned with the continuous adjustment of the organism to its external relations"; and James' (1896) "psychology is the science of mental life".

From the many very different definitions of which the above is a very small sample, it might be possible for psychologists to agree on one thing only, that there may be as many definitions of psychology as there are people who call themselves psychologists (government registered or otherwise).

The more complex task of defining applied psychology is therefore almost impossible, except that the more cynically inclined might be tempted to suggest that it consists of applying what psychologists cannot agree on. Fortunately it is not necessary to be hobbled by attempting to define psychology or applied psychology, because the problem is usually circumvented by regarding anything considered by psychologists in their research or their professional roles as being part of the subject matter of the discipline. The subtle difference between psychology and applied psychology can be seen through the differentiation of the roles of psychologists into researchers and professionals. Anything the latter use can be regarded as applied psychology. Research on the other hand can be either psychology or applied psychology.

Over the years a tendency has arisen to make research undertaken to seem as applied as possible. This is done because there is a greater likelihood of funding for research if its outcome can be seen to have some direct application. As a consequence this has led to concern amongst psychologists about the applied nature of their discipline.

Belbin (1979) has talked about a differentiation between an applied approach and an applicable approach in psychology saying that "In general a strong technique approach favours an applied approach while a strong problem orientation favours an applicable approach". A comparison is made in her paper to the applied/applicable distinction in mathematics where "applied mathematicians are concerned with applying knowledge and models to some external field. Applicable mathematicians have used their knowledge ... in a way which stimulated operations research".

There is here a great danger, because one of the differences between psychologists and mathematicians, in this respect, is that the general public would be reluctant to call themselves amateur mathematicians, but are far more willing to be amateur psychologists. Miller (1964) talks about psychology passing through its initial stage where it is still intelligible to most people: "In order to stay alive among our fellow men, we must all be psychologists. Of course, survival requires us to be mathematicians, physicists, chemists, and biologists, too, but there the distance has grown too great; no layman claims brotherhood without a prolonged initiation ritual conducted at some accredited university." The recent 'professionalisation' of psychologists through registration procedures around the world can be seen as a desire to achieve the same status. Psychologists also have many more competing professionals, such as personnel managers and training managers who usually lack a training in psychology and consequently often fail to see the point of carrying out such exercises as validating selection procedures or evaluating training methods. The main arguments usually revolve around the time evaluation takes and indeed in the case of training research, quasi experimental designs have evolved, that have gained respectability in the literature (Cook and Campbell 1976). This has occured because of the practical difficulties of implementing Solomon's (1949) 'ideal' design, which incorporates an experimental group, a control group with no training, a placebo group with false but plausible training, a group which has a pre course test but no post course test, and a standard control group which has both a pre course test and a post course test. The applicable psychology advocated by Belbin seems designed primarily therefore to appease these competing professions rather than to carry psychology into a truly practical discipline. Much also depends on what Belbin intends when she states later that psychologists should "move away from merely collecting statistics", because in the past it has not so much been the collection of statistics that has been at fault but the difficulties practitioners have had in understanding them. This occurs, (despite the views of psychologists such as Howell (1976), who believes that psychologists are practitioners,) because practitioners are often not trained in psychology and fail to appreciate the limitations of some of the techniques they use.

Pond (1982) supports the view of the increased use of psychology by practitioners by pointing out that: "The influence of writings of occupational psychologists has gone well beyond those with the formal psychological training who could style themselves psychologists". Unfortunately the influence may be strong but the understanding of many practitioners seems to be very limited. The popularity of the selection interview which, as will be shown in the next chapter has low validity, is a good example of this phenomenon.

In a recent paper, Duckworth (1981) has advocated the development of psychological engineering based on Herbert Simon's ideas on engineering (Simon, 1969). Duckworth emphasises the necessity of teaching psychologists how to bring about change in real life settings. The problem is the way that this can be done. No real practical possibilities are mentioned, except some general statements about more field and practical work in psychology courses. It is also debatable whether psychology as a result would become more applied, or whether it would still be dependent on non-psychologists for its implementation.

Rather than conceiving of applicable psychology or psychological engineering it may be more meaningful to conceive of a continuum from pure psychology to practical psychology as shown in figure 2.1

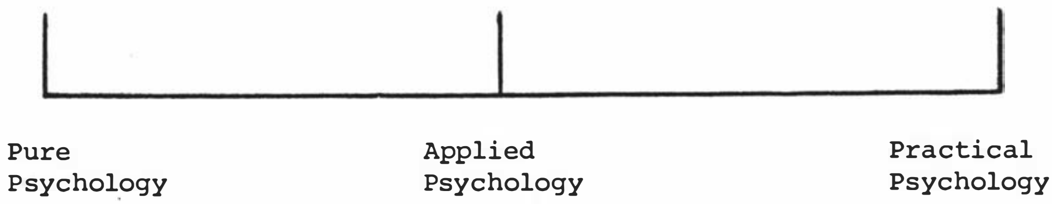


Figure 2.1 A psychological continuum

The essential difference between practical and applied psychology is that the former is psychology which can be understood and implemented by non-psychologists. Applied psychology, on the other hand, is that content of psychology which could be useful, but which is often not implemented because it has no immediate appeal for practitioners, or it is too technically complex. The considerable evidence for the necessity to statistically combine rather than clinically combine information gained through the selection process (Meehl, 1954), is an example of this phenomenon. The fact that there would be little argument that this rarely occurs is an example of applied psychology not being used in practical settings.

<u>2.2 Examples of Applied Psychology as opposed to Practical Psychology</u>

Further examples of applied psychology as opposed to practical psychology are easy to find. A later Chapter (Chapter 6) deals with methods available to optimise selection decision making. Its whole content with its emphasis on linear relationships between predictors and criteria, despite its apparent usefulness, cannot be regarded as practical psychology, because of its mathematical content. The mathematics is of a very rudimentary nature, but it would still be sufficient to put many practitioners off.

The content of some theories such as that of Maslow's (1943) need hierarchy theory have been part of the content of applied psychology and are certainly well known by practitioners. Wahba and Bridwell (1976) have concluded, however, that there is no longitudinal support for the theory, and it has more of an historical rather than a functional value. The negative results obtained when the theory has been tested have not largely been communicated to practitioners. Evidence for this is sparse, but is based on the experience of the author that one theory generally well known to and quoted by practitioners is Maslow's need hierarchy. Here we have the situation where psychology which has been discredited is being used by practitioners. In a sense Maslow's theory no longer has a place in applied or practical psychology but like many popular diversions such as astrology may never in fact disappear because of its plausibility.

2.3 Examples of Practical Psychology

The formal definition of practical psychology would therefore be the development of valid methods or approaches in psychology which can then be used and easily understood after appropriate training by practitioners. It should be emphasised at this point that where non psychologists are involved in designing and validating the fruits of practical psychology, they must be trained and guided by psychologists. As an example, a form of training for non psychologists wishing to use the in basket test, the main focus of the present research, is described in chapter 12.

Examples of practical psychology are not numerous because of the exacting requirements necessary for psychological research to be both valid and easily understood by practitioners. Much of what has come to be called Ergonomics in Europe or Human Factors Engineering in the United States of America, can be regarded as good practical psychology. Design research in Ergonomics by Jenkins (1947) for example, isolated 11 shapes (see figure 2.2) which were readily identifiable by touch, even when gloves are worn. The orginal work was done for the design of controls in aircraft, but there appears to be no reason why the results could not be used in any situation where similar controls have to be distinguished by an operator. There is little doubt that the value of this work can be readily appreciated by the practitioner, and where practitioners have control over the design process they would use the design shapes recommended by Jenkins.

Similarly Chapanis and Lindenbaum's (1959) work on control burner arrangements on stoves is easily understood by practitioners. Chapanis and Lindenbaum experimented with four control burner arrangements (see figure 2.3). In the four configurations the control letter which matched the same letter on the burner, operated that burner. Chapanis and Lindenbaum measured the reaction times of fifteen subjects over 80 trials on each design. The subjects were asked to turn on a particular burner on a stove, and their reaction

Shape-Coded Controls

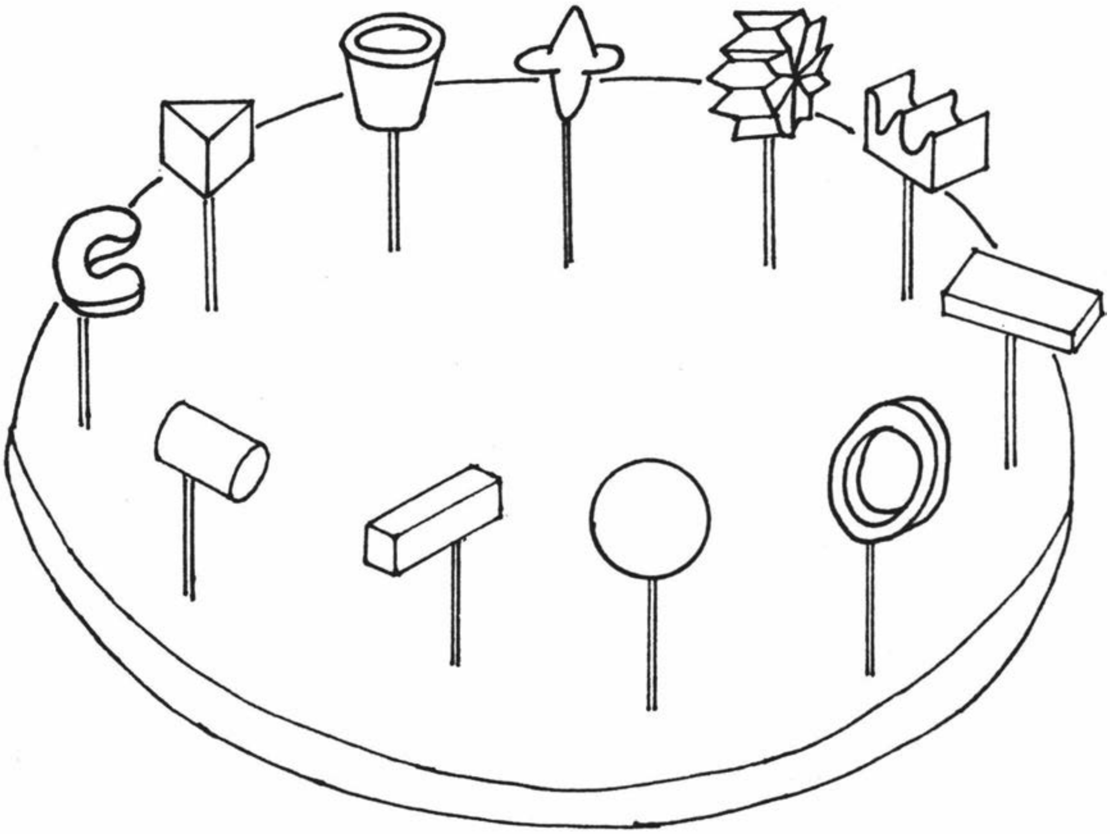


Figure 2.2 The apparatus used by Jenkins (1947) to select knobs for shape coding of controls. The 11 knob shapes shown were found to be readily identifiable by touch.

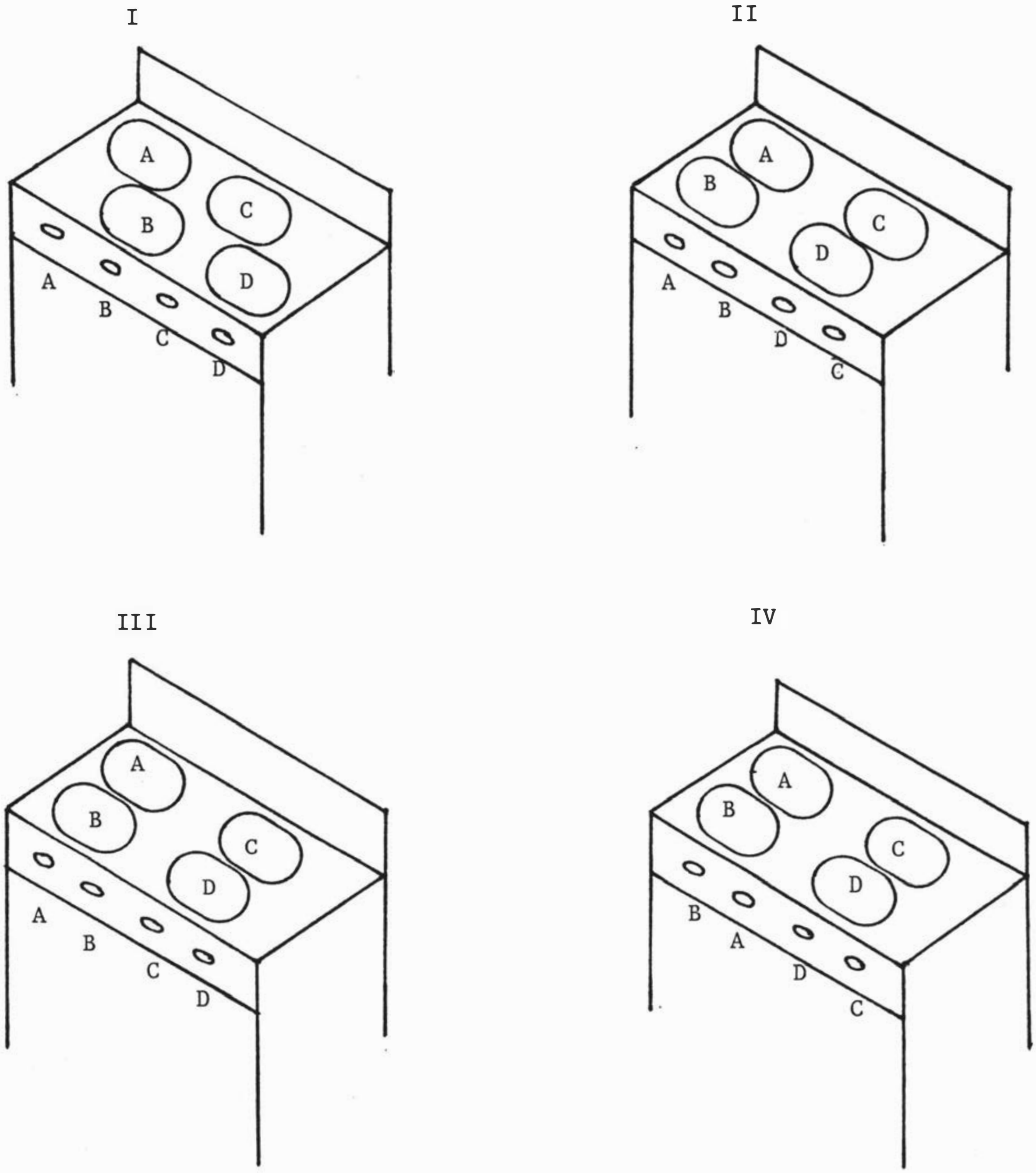


Figure 2.3 Four cooker control panels tested in a study by Chapanis and Lindenbaum(1959).

time, i.e. the time it took them to turn on the correct control, was measured. Errors were also recorded. Design 1 had the fastest overall reaction time and the least errors. Designs 2,3, and 4 got progressively worse in terms of errors made and reaction times; with design 4 having a total of 129 errors out of 1200 trials compared to no errors on the first design. Clearly, the first design was the best. More importantly a person looking at the designs would probably agree. It is an indictment of New Zealand psychologists that in New Zealand no cooker is designed using the configuration of design 1. This illustrates the importance of the communications role for practical psychologists. The details of this research on cookers can only be found in academic journals (Human Factors in this case) or reported in Ergonomics texts such as McCormick's "Human Factors in Engineering and Design" (1976) or Murrell's "Ergonomics" (1965). If an uncynical view of practitioners is taken, it is apparent that these sources are not consulted by practitioners so the benefits of superior design are not implemented because the designers of cookers are unaware of them. The general public who are the users of cookers have the same difficulty. What is needed is for the research to be made more available. For this research, even in its formal academic presentation is easily understood, which is what makes it practical psychology.

Practical psychology suffers in one respect, because of its obvious nature. Practitioners are often unimpressed by the necessity of proving experimentally that an effect exists or that one design is better than another, when it is obvious to them by just looking at it that this is so. Human judgement is however error prone and susceptible to bias. The common belief among drivers of automobiles that alcohol does not impair their driving skills is an example of this. The evidence from research by Drew Colquhoun and Long (1964) and many others, shows how wrong they are. Even if an effect appears obvious, experimental verification is necessary.

Ergonomics itself also suffers from problems brought about by its obvious nature. Thus when individuals are told about the ergonomic reasons for the occurrence of such events as aircraft crashes, while there is an appreciation of the error that has been made it does not necessarily lead to a lower error rate among individuals subjected to material of this sort, who go on to design equipment. To prevent simple design errors individuals have to learn the stages required in the design of any equipment to prevent such errors. These stages are not fixed and can only be learnt through a case study approach using experimental material from such sources as Weiner and Maule's (1977) book of case studies or from well reported descriptions of the design of equipment using ergonomic principles. Efficient design, like much that is excellent, appears effortless. It is only when it is attempted that its difficulty is apparent. The apparent effortlessness of good design has often encouraged practitioners to bypass the steps necessary to achieve it. This has occurred because of ignorance or a belief that the steps are not necessary. Practical psychologists have a duty to educate practitioners of the dangers of such an approach.

An interesting diversion at this point is the belief that some ergonomists must have that all ergonomics cannot be applied. There are two major journals based in the United Kingdom; Ergonomics and

Applied Ergonomics. It is a sad development that a discipline such as Ergonomics which should be devoted to solving practical problems has necessitated the introduction of a journal called Applied Ergonomics, which for a journal title seems repetitive. This difference between Ergonomics and Applied Ergonomics is analogous to the applied psychology/practical psychology approaches in mainstream psychology, except that the difference between applied and practical psychology is not so well recognised. The content of the Journal of Applied Psychology for example does not have the majority of its content devoted to practical psychology. It is left to a small minority of psychologists to promote practical psychology in industry with the consequence that, where they are not available, practitioners fend for themselves with sometimes disastrous results.

2.4 Programmed Instruction and Practical Psychology

Programmed Instruction is another example of practical psychology. The method can be traced to Socrates, who used it as a technique in his instructional dialogues (Cohen, 1962). Its modern development however owes much to the work of B.F. Skinner originating in his article on "The Science of Learning and the Art of Teaching" published in the Harvard Educational Review in 1954 (Skinner 1954) and S.L. Pressey who designed a simple teaching machine in the 1920's (Pressey, 1926). Programmed instruction has instant appeal to practitioners because once made familiar with it, they are able to try it out for themselves. The instant rewards which are an integral part of the method, lead to a favourable impression by practitioners. Training managers who have become acquainted with teaching machines, have also been attracted by the reduced salary bills resulting from the introduction of the machines. This results from the process not involving a face to face teacher-pupil interaction. Abma (1964) noted that at the time he wrote, about 350 commercial programmes for teaching machines were available. Unfortunately, for specific use in training in a particular factory programmes often have to be individually designed. This was not originally recognised by many of the companies and it led to some, like Clarks Ltd. the shoe manufacturers of Street, Somerset, United Kingdom, for whom the writer worked, having a number of teaching machines being unused. This occurred because of a lack of suitable programmes for the company who had not arranged to employ a person to design them.

Research evidence on the value of programmed instruction stresses two important points. First that a large initial superiority of programmed instruction over other techniques declines markedly over the six months after instruction (Holt, 1953). Secondly material presented by the various programming methods is learned no better than by conventional means, but may be learned faster (Nash, Muczyk and Vitorri 1971). Fiedler, Charmers and Mahar (1976) have used programmed instruction for an approach to the training of leadership skills they call "Leader Match" and concluded that programmed instruction may be more widely applicable than is at present believed amongst psychologists, who tend to believe that its use is restricted to simple skills, such as understanding metrication or spelling.

There can be no doubt that programmed instruction fulfills the requirements of practical psychology. It has experimentally proven validity, and has an immediately understandable appeal to practitioners. Again the technique has suffered from poor publicity with the result that many people involved with training appear unaware of its existence. This situation could be relatively easily remedied, especially with the recent development of microcomputers which would make programmed instruction more viable, because it removes the need to buy purpose built machines. The latter are often preferred to books for the presentation of the material in programmed instruction, but of course are not vital for its implementation.

These examples show that practical psychology is an approach which is important for the development of psychology as a whole. What is needed is the application and promotion of valid applied psychology that has an obvious appeal to practitioners. One of the more important areas of research in applied psychology is personnel selection, especially management selection, because of the necessity of all organisations to select people at some period in their development. Research on selection is now considered to highlight those techniques which can be considered to be practical psychology, and to isolate research which could improve the standing of any particular selection method in practical psychology.

Chapter 3

INTERVIEWS, REFERENCES, AND APPLICATION FORMS

3.1 Selecting People for Work

Selecting people for work is an important managerial function which should command considerable attention from managers if they want to succeed in improving the productivity of the workforce. In general terms it is only possible to speculate how well this function is carried out. A New Zealand survey for the New Zealand Institute of Personnel Management on psychological tests (Hesketh 1974) showed that the most popular was the Sixteen Personality Factor Questionnaire (16PF) (Cattell 1970). Since there is considerable evidence that the predictive validity of the 16PF for selection purposes is suspect (Guion and Gotier 1965, Smith 1970, Hogan 1974, Bull 1974,) it suggests that at that time a large section of New Zealand industry was unaware of the problems associated with this particular test. This is probably the reason for the test's continued popularity together with its extremely high face validity, in that personality is a very plausible consideration for most jobs, especially those in management.

The most popular form of selection, however, is the interview. Surveys in the United States in 1930 of 236 firms and in 1957 of 852 firms showed that well over 90 per cent of the organisations surveyed conducted interviews (Spriegel and James 1958). Although no specific studies have been conducted on the rate of interviewing in New Zealand there is nothing that suggests that it is any lower.

Interviews are popular from the point of view of the hard pressed employer because they are quick and easy to arrange and appear to require little effort to conduct. There is also a natural desire for employers to see candidates face to face which almost inevitably leads to this meeting playing a part in the selection process.

The employment interview however, has a poor record as a reliable and valid means of distinguishing between good and poor workers. Its widespread use is a good example of the communication problems between practitioners and psychologists in the area of selection.

3.2 Reviews of the Validity and Reliability of the Interview.

Over the years a number of reviews of the interview have been conducted (Wagner 1949, Mayfield 1964, Ulrich and Trumbo 1965, Wright 1969, and Schmitt 1976). While there has been a slight change in emphasis through to the present day in that Schmitt, for example, considers the various factors that influence decision making in the interview and looks positively at its status, nothing alters the facts of the reviews which rarely quote average validity coefficients for the reviewed studies above .3 or reliability coefficients that are generally acceptable for selection methods as a whole. Wagner's review looked at 106 different articles: there was quantitative information on the value of the interview in only 25 of them. There were only 34 reliability coefficients available for 174 different sets of ratings, ranging from .23 to .97 for ratings of specific traits and -.20 to .85 for ratings of overall ability. Only the rating of intelligence achieved a reliability above .4.

Ulrich and Trumbo's (1965) later study is somewhat more revealing. They examined all research articles on the interview since 1949 and their results were summarised in the form of a table by Blum and Naylor (1968), which is reproduced as table 3.1. In summarising this data Ulrich and Trumbo said: "It is apparent, first, that few studies have reported reliabilities, and second, that those reported, with few exceptions are lower than usually accepted for devices used for individual prediction. Reliability coefficients of criterion ratings were almost never reported but probably did not exceed those reported for the interview. Therefore, unreliability remains a serious source of attenuation for any validity coefficients which might be found". As things stand there is no reason to suppose that the reliability of the interview has improved in practical use since Ulrich and Trumbo's (1965) review.

The validity of the interview has also been considered in some detail by reviewers, and the results are similarly depressing. Ulrich and Trumbo (1965) divided all validity studies in their research into three separate parts depending on the criterion used. They were:

(1) Predictions of proficiency ratings

(2) Predictions of success in training

(3) Predictions of psychiatric ratings or discharge.

In only very few of the studies was the interview a significantly valid predictor of either job or training success or psychiatric ratings or discharge.

Study	Results Listed by Ulrich and Trumbo
Strupp & Williams (1960)	"Significant" interrater agreement on 9 different traits.
Sternberg (1950)	Reliabilities ranged from .15 to .71
Bonneau (1957)	Interrater reliabilities in .80's
Anderson (1954)	Interrater reliabilities in .80's
Shaw (1952)	Reliabilities ranging from .71 to .78
Prien (1962)	Reliabilities of .55 to .62
Raines and Rohrer (1955)	Reliability of .15
Plag (1961)	13 to 15 reliabilities significantly greater than 0
Zaccaria et al (1956)	Reliability estimated at .72

Table 3.1 Reliability coefficients obtained for the interview (from Ulrich and Trumbo 1965)

The classic study by Kelly and Fiske (1951) illustrates the problem of the validity of the interview rather well. In 1946 a large number of students accepted for postgraduate courses in the United States came to Ann Arbor so that psychologists could predict their probable success. One part of the experiment consisted of the psychologist attempting to answer the question: "How well will this student: effectively master course work content; successfully complete courses in general psychology, clinical psychology, statistics and related fields; satisfy requirements for the doctorate; and pass general examinations?"

Assessments of performance were made on an eight point rating scale. One group was rated on credentials (college grades and references) alone; a second group was rated on psychometric test scores alone; a third group on interviews alone; and a fourth group on a combination of psychometric tests and interviews. After three years, academic staff assessed students who had taken part in the research by ranking students on their academic performance from the best to the worst. The rankings obtained were used to test the predictive validity of the psychologists' judgements at Ann Arbor. These results are illustrated in table 3.2.

The overall result is quite bad for the interview in that its addition actually decreased the validity of the ratings made by the psychologists. To be fair, however, the overall picture in the study is not so destructive. The psychologist had also made 11 other predictions of such things as research competency and integrity; these results are shown in table 3.3. In this instance some marginal improvement in predictor scores can been seen through

Predictor	Correlation with Academic Performance
Credentials Alone	.26
Credentials and psychometric test scores	.36
Credentials, test scores, & 2 hour interview	.32

Table 3.2 Correlations between interview predictions and actual performance (from Kelly and Fiske 1951)

Predictor	Median Validity for Criteria
Credentials Alone	.22
Credentials and psychometric test	.29
Credentials, test scores & 2 hour interview	.31

Table 3.3 Median validity coefficients between predictors and criteria (after Kelly and Fiske 1951)

the addition of an interview. The overall conclusion of this important study must remain, however, that the interview added very little to the predictions of the psychologists about success on a job with which they had had years of experience.

3.3 Criticisms of Kelly and Fiske's Work

It is important to remember that since Kelly and Fiske never considered the interview as the sole source of information that in their study it is not possible to make absolute statements regarding the interview's validity. Also as Rodger (1952) points out the judgements were based on unstructured interviews and the students and psychologists are reported as low in motivation because of the large amount of testing in the whole project. There could in the study also have been low validity coefficients because the interviews were not real, in that the students had already been accepted for their courses. There could be a considerable simulation gap between the task at Ann Arbor as it was, compared to assessments made in a real selection situation.

The first and last criticisms seem valid though there are many reviews such as that of Carlson (1972) which have shown a large number of real life interview studies which fail to show validity coefficients above .25. The two criticisms by Rodger taken at face value seem reasonable enough but do not really consider the selection interview in its real life setting, which is where one would hope validity coefficients would be at their highest. It is arguable for example whether structured interviews are better than unstructured ones. Extremes of structure would preordain all questions and there could be little more benefit in an interview of this type than giving candidates questionnaires or application forms to fill in at home. Indeed, the latter would be considerably cheaper. As to the problems of the motivation of interviewers the situation faced by the psychologists at Ann Arbor is not so very different from the sometimes gruelling interview schedules organised by selection boards. The motivation of interviewers could be regarded as a small problem however, if one believes in the rewarding potential of the selection interview itself. This point is elaborated later.

3.4 Reactivity and the Interview

Bayne (1977), in his support of Rodger's criticisms of Kelly and Fiske's work, goes on to support Webster's (1964) view that the interview is "reactive" compared to other ways of trying to assess personal qualities in that the interviewer can affect the interviewee's behaviour. In techniques such as the personality test, attempts are made to exclude this reactivity through standardisation since the questions are the same for all candidates. Bayne suggests that this reactivity should be "utilised explicitly and as fully as possible .... and each interviewer is an individual test and should therefore be validated separately". It can be argued that increased structure in the interview would reduce if not destroy this reactivity since, as has already been said, the more structure the interview contains the more likely its scope will be predetermined. This belief in the importance of reactivity implies that there are certain interactions between interviewers and interviewees which will have positive effects on the assessment process. Developing this idea further, it might be possible to identify ways of controlling interactions and training people, or selecting people, to have a wide repertoire of interactive skills and develop reactivity dyads which enable highly valid predictions of future performance.

Even if the skills can be identified and interviewers trained, the evidence from the human relations training literature does not indicate that any sustained change in interviewer behaviour can be maintained in an on the job situation. As Fleishman, Harris and Burtt (1955) said, "With reference to training in human relations, our study yields one clear implication ... Our foremen developed a point of view in school but lost it on their return to the plant if their superior had a different point of view ... this suggests that to improve social relations almost anywhere, it is important to work on the whole social setting. It is not possible to pull people out of this setting and consider everything fixed". Thus it may be that the present argument is tautological in that individuals with a wide reactive repertoire would have to be selected and not trained, presumably using interviews or any other predictors available. The interview could be regarded as a more formal interaction and possibly less susceptible to change by peers in the work situation. It is difficult to imagine, however, that trained individual changes of behaviour could replace permanently habits of a lifetime, unless very careful monitoring was carried out on the job, which in most instances would be impractical.

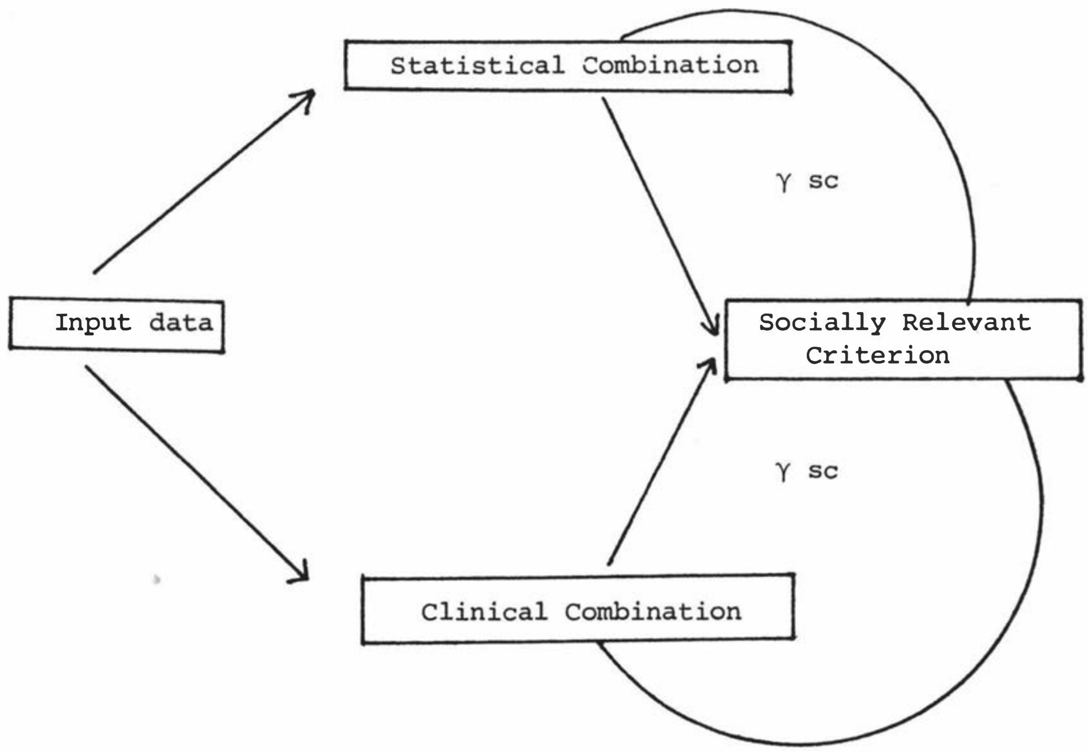
3.5 Current Trends in Research on the Interview

The present mood of the literature on the interview is one of optimism. Articles such as those by Carlson (1972) and Landy (1976) suggest that recent studies show an improvement for the validity of the interview possibly because of the use of better ranking procedures in the evaluation phase of the interview. Landy and Trumbo (1980) further argue that in validation studies interviewers are often asked to rate applicants on a number of traits, then validate the ratings against derived job performance criteria. They conclude that the resulting low or non existent validities reflect the inability of the interviewers to assess the traits. They suggest that another possible explanation could be the lack of validity of the traits for predicting job performance. This may well be so, but it does not explain the generally better results for the prediction of job performance using other predictors such as work sample tests which deliberately replicate the content of the job analysis for predictive purposes (Downs 1968, Robertson and Downs 1979). In a recent article Herriot (Herriot 1981) has also observed that from the perspective of attribution theory, that unless both interviewer and interviewee are working from the same assumptions, the interview can not be expected to be valid. This may be another reason for the poor results obtained in research on the validity of the interview.

3.6 Clinical versus Statistical Decision Making

The process of interviewing requires the integration of large amounts of data so that a final decision can eventually be made. There can be no doubt that what the interviewer is doing if he or she is the final arbiter of success or failure is clinical prediction. Wiggins (1973) defines clinical prediction: "when human judgement enters into the combination of input for the forecasting of criterion behaviours we speak of clinical prediction". The alternative to this is a combination of data by a statistical technique such as multiple regression. The validity of the interview in practice really stands or falls on which of these two is the better, because it is rare for the final combination of data not to be done by the interviewer alone, using a clinical technique. In a very widely publicised monograph, Meehl (1954) looked at the empirical literature involving comparisons of clinical and statistical prediction methods. Despite the fact that as Gough (1962) has revealed there is a long history of argument about the merits of the two methods there were very few studies for Meehl to review. There was also the added problem that almost all of the studies suffered from inferior designs. Essentially however, the design for evaluating the best method for combining data is quite simple: the same information (the independent variable) is provided for an individual and for a computer, and each is asked to make predictions of a future behaviour. Wiggins (1973) has elegantly summarised the design as a diagram which is reproduced as figure 3.1.

When Meehl reviewed the pre 1954 literature, 20 studies were



Possible Outcomes

$\gamma\ sc = \gamma\ cc$

$\gamma\ sc < \gamma\ cc$

$\gamma\ sc > \gamma\ cc$

Figure 3.1 Basic design for comparison of clinical and statistical prediction (Wiggins 1973) discovered which could be said to compare clinical and statistical data - combination methods. Most of the studies however, failed in some way to follow the requirements of the design. The most common problem was that the information provided for the two different forms of combination was often different thus giving one method an advantage over another. Despite these problems Meehl's summaries of studies shown in table 3.4 are devastating for proponents of clinical combination. The last two reviews by Meehl were undertaken after a wide reaction mainly from clinical psychologists to the original review. Examples are Sanford (1956), Gough (1962) Harris (1963), and Sawyer (1966).

The net result of these reviews from the point of view of the person making decisions in industry is that a clear distinction should be made between data gathering and decision making and also that statistical techniques should be used to combine the data for decision making purposes after it has been gathered. More recent research has tended to concentrate on the way in which interviewers interpret discrete items of information about candidates to form overall evaluations of them. Schmitt (1976) has suggested that the refined ranking and scaling procedures now available for interviewers have improved the combining of data and interviewers' judgements can be made more accurate through use of the new techniques. Wiggins (1973) also suggests that the actuarial approach, more commonly associated with weighted application forms, could also be applied with some success to the scores derived by interviewers on these rating scales.

Source	No. of studies	Prediction Domain	"Box Score" Stat >Clin	Stat = Clin	Stat < Clin
Meehl (1954)	16-20	Success in Academic or Military Training recidivism and parole violation recovery from psychosis.	11	8	1
Meehl (1957)	27	Success in academic or military training, recidivism and parole violation; recovery time psychosis; personality description, outcome of psychotherapy.	17	10	0
Meehl (1965)	51	Success in academic or Military, recidivism and parole violation; recovery from psychosis; personality description; outcome of psychotherapy response to shock treatment, formal psychiatric nosology; job success and satisfaction, medical diagnosis (non-psychiatric).	33	17	1

Table 3.4 Summary table of reviews using "Box Scores" of clinical versus statistical combination of data

3.7 The Ignorance of Interviewers

If this is a more valid way to use selection interviews it has a number of problems if it is to be accepted by the majority of people using this method of selection. Any improvements for the interview in the practical setting are likely to strike almost insurmountable difficulties because of the wide acceptance of interviewing as a method of selection, the lack of appreciation of the limitations of the interview and the ways errors can be made by interviewers. A good example of this is provided by an individual taught by the author who was told of research conducted since the early 1960's on the interview. In essence the information provided him is summarised from a table adapted from Wexley & Yukl (1977):-

1 Each interviewer has a specific stereotype of the "ideal" candidate that is used as a standard in assessing actual candidates (Mayfield and Carlson 1966).

2 Interviewers normally form biases about an applicant early in the interview (Spingbett 1958, Webster 1964).

3 The relative importance given to various content dimensions (e.g.scholastic standing, experience, interest and activities) varies among interviewers (Hakel Dobmeyer and Dunnette 1970).

4 Interviewers are more influenced by unfavourable than favourable information (Miller and Rowe 1967).

5 Interviewers rate applicants more favourably if the applicants are perceived as being similar to themselves (Rand and Wexley 1975, Wexley and Nemeroff 1974).

6 The more an interviewer talks the more favourably the applicant

is evaluated (Mayfield 1964).

7 Interviewers are susceptible to contrast effects; i.e. their evaluations of applicants are influenced by their rating of immediately preceding applicants (Rowe 1967, Wexley Yukl Kovacs and Sanders 1972).

8 Interviewers are vulnerable to "halo effect" - the tendency to allow one's overall impression of an applicant to generalise across trait ratings in either a positive, negative or neutral direction (Webster 1964).

The information is a summary of some major findings, and the male accountancy student concerned decided on the basis of a statement in a lecture and an article suggesting advice on handling interviews (Smith 1976) that it might be possible to use these findings to manipulate interviews in favour of positive outcomes for the interviewee. The student concerned did so with the result that out of ten jobs applied for the student was successful in securing an offer of employment in them all. It is important to know that the student performed well on the course as he did on other courses and he might have been accepted despite his attempts at manipulating the interview in his favour. However, he felt that there was considerable value for an interviewee in being aware of the research on the interview. The student went on to suggest that the most valuable information was that discovered by Mayfield (1949), which showed that the more an interviewer talks the more favourably the applicant is evaluated. In one case the student had applied for a position in a Knitwear factory and decided that one of the best ways to get the interviewer to talk was to wear one of the factory's jerseys. He described the interview as being of 40 minutes duration in which time the interviewer talked for the first 30 minutes about how the jersey was made. The final ten minutes was spent answering a few simple questions and being offered the job on the spot. A case possibly of a good candidate using his intelligence to get himself a job and arguably in favour of interviews since he was seen to be a good candidate. Nevertheless it is interesting to speculate on how well candidates for jobs would generally do if they were coached, compared to being uncoached. It would in an experiment of this sort be difficult, of course, to decide the contribution of the training to performance on the job. It is difficult to assess the knowledge of an interviewer in any empirical way and it could well be that most interviewing is done with a full knowledge of the problems and difficulties of conducting interviews. The overall evidence of the poor validity of the interview suggests that this is unlikely.

3.8 Some Reasons for the Popularity of the Interview

There may well be truth in the suggestions by Bayne (1977) and others that the interview when conducted properly has much promise for selection. The problem seems to be in getting practitioners to carry out interviews in a psychologically approved way. One obvious method is through training but as Bayne says of current courses "their effectiveness has not been demonstrated". The problem could lie in the nature of the interview itself in that as a skill it is very difficult to distinguish from ordinary everyday conversation. Indeed Bingham and Moore's (1939) definition of the interview as "a conversation with a purpose" highlights this problem. This similarity encourages much wider use of the interview than other selection techniques and often one could speculate that managers are reasonably happy to conduct interviews because of their "developed" experience in dealing with people. The dynamics of the interview also contribute to its continuing use. From such research evidence as the more the interviewer talks the more favourably he judges the candidate (Mayfield 1964), and the more similar they are to themselves the higher the interviewer rates candidates (Rand and Wexley 1975), we can conclude the interview has powerful rewarding properties.

There is an old proverb "Speech is silvern: silence is golden". Certainly for some the very opportunity of being able to talk and have someone to listen can be a rewarding experience. For the interviewee the gold comes from the interviewer's positive reaction to their silence. In the selection interview there are strong reasons for the interviewee to listen to the interviewer in that a lack of attention on the interviewee's part could result in a failure to be offered a job. For the interviewer opportunities could be few for having an audience as attentive as a candidate at an interview. There is evidence from the literature on personality testing that these tests can be falsified (Whyte 1957). People, particularly when they are applying for a job, try to give what they consider to be a right answer to questions on these tests rather than an honest answer. So too in the selection interview interviewees will try to be as the interviewer wants them to be; very often this will be like the interviewer. For the interviewer, there is nothing so rewarding as having someone who agrees with you. A study by Keenan and Wedderburn (1980) looked at candidates' descriptions of interviewers amd concluded that "Interviewers were found to give more frequent coverage to topics concerned with future job and knowledge of company, than present or past academic performance". The results were interpreted as indicating an interviewer preference for topic areas where they had an advantage over the candidate in terms of superior knowledge. This shows perhaps that interviewers tend to steer the interview in a direction that will ensure rewards for them.

It can be argued therefore that conducting selection interviews has its own inbuilt incentives which explains part of their continuing popularity. It may be possible to improve the validity coefficients for the interview by some of the methods already suggested, but for reasons of practical psychology, they would prove much more difficult to improve than other techniques already available for selection.

If practitioners are to be encouraged to use more valid selection procedures it is obvious that the techniques themselves must have an intrinsic appeal to them and have what psychometricians call face validity. The selection interview, for example, certainly possesses it as a technique but unfortunately it is at present used inappropriately. Shouksmith (1978) has talked about some of the difficulties inherent in the interview and in his book shows ways in which interviews can be improved as a selection measure. However, the methods of improvement are more of what could be called applied psychology rather than practical psychology since the subtleties of interviewing would either be lost on many practitioners or the human relations nature of the training required to implement them would disappear in the practical setting.

As a selection technique interviews therefore can be valid but despite an increased optimism in the literature there does not seem to be any real way of ensuring that even 10 per cent of the interviews carried out meet the requirements for improving their validity and reliability.

What is needed is the promotion of selection methods for managers and all jobs which have intrinsic appeal for practitioners and also meet the psychometric requirements of psychologists as far as is possible. Other selection methods will now be considered to establish which are most likely to meet these requirements.

3.9 References and Testimonials

One of the problems involved with validation studies of the interview is that researchers are often unsure whether they are conducting a study on the interview alone or on the interview in combination with other selectors. In real life other techniques are always available and are used in common with the interview. It seems false to omit them from validity studies, for their actual existence means that it is extremely difficult to evaluate the interview per se, unless they are excluded, which would be unreal in view of the way this extra information is used.

One of the many pieces of information available to interviewers is a reference or testimonial. There is a difference between a reference and a testimonial which would remove amibguity from the literature if the terms were used appropriately. This ambiguity is particularly prevalent in New Zealand.

3.10 The difference between References and Testimonials

There are two general ways in which a reference or testimonial data is obtained. One involves an applicant asking a previous employer or friend, or a minister of religion to write a few words in his or her favour so that the document can be presented to a prospective employer, usually as nothing more than an indication of honesty. In many cases the same document could be used for a landlord if the person concerned wanted to rent a place to live. The writer would always feel a certain constraint because the document would be viewed by the person who was being written about and consequently the text would usually be relatively uncritical of the person concerned. There are also considerable difficulties involving the authenticity of such documents since it is not impossible for unscrupulous applicants to write them for themselves.

Another technique favoured by some organisations is to ask individuals applying for jobs to supply the name or names of people who would provide the organisation with some indication of the applicant's suitability for the job. The difference between the two is clear. In one case the applicant sees what the person writes about them: in the second case they do not. The former are testimonials and the latter references. For the purposes of the ensuing discussion, however the term references will be used when no distinction is made between them in the literature. Testimonials should not be used for selection because of the authenticity problem.

3.11 The Validity and Reliability of References and Testimonials

In the United States it would appear that the popularity of written references has declined considerably. A 1930 survey showed that 83 per cent of companies reported they required written references; in 1957 in a similar survey, only 50 per cent reported that they required them (Scott, Clothier and Spriegel 1961). Whether this could be extrapolated to New Zealand is uncertain. However, one of the largest employers, the Public Service, still have a requirement for references on their general form of application, the PS17a. One can only guess at attitudes to references, but there is a possibility that references are obtained more out of habit than a general belief in their usefulness for selection. Indeed, validity evidence on references is rather sparse with most emphasis going to Mosel and Goheen's classic studies (Mosel and Goheen 1958, 1959, Goheen and Mosel 1959). In their 1958 study, Mosel and Goheen looked at the references of more than a thousand people who were working for the civil service in a dozen trades and concluded "Results show that Employment Recommendation Questionnaires (seemingly references in this case) had practically no value in predicting later supervisory ratings".

One difficulty in writing to people for references is that one does not always get a reply. In their study Mosel and Goheen found that only 56 per cent returned a completed reference questionnaire, 23 per cent returned it incomplete, 18 per cent failed to return it and 3 per cent returned the reference unopened. Mosel and Goheen also discovered that a low percentage of responses were negative. It is possible that the incomplete and unreturned questionnaires were the ones which contained negative items.

Another problem is that there are a number of reasons for positive or negative references. Referees, if they are employers, can give candidates a good reference so that they can get rid of them. On the other hand, the same employer could give a candidate a bad reference so that he or she would have to stay in the employment of the referee. If a testimonial is given it is unlikely that a candidate would present a negative one to a prospective employer. Discriminating between the truth and embellishments of the truth is one of the most difficult tasks of the people who have to read these documents. Yet another difficulty is the lack of a normative standard to make comparisons between the rather general statements made by different referees about different candidates. Attempts are made to get round this by using questionnaires, but if the questions are open ended the problems of interpretation remain.

It would seem that few referees are devious enough to provide negative references to retain employees for, as has previously been mentioned, Mosel and Goheen only found 1 per cent of their applicants were given a poor reference. This could, of course, mean that this 1 per cent were unjustly given a poor reference, but this seems unlikely. It does appear that probably for reasons of poor design, the reference does not discriminate well, for over 50 per cent of the candidates in Mosel and Goheen's study were given outstanding ratings. One major problem with references seems to be that average reference writers do not seem to know clearly what they are writing about. On Mosel and Goheen's employment recommendation questionnaire was the question: "Is the applicant especially qualified for ... the trade in which he seeks employment?" The assessments of radio mechanics, auto mechanics, and painters who had received an unqualified "yes" answer in their references were compared to the assessments for comparable groups who had received an unqualified "no" answer. There was no significant difference in the rated job performance of the two groups. In fact, the "no" group of painters had slightly higher ratings than the "yes" group.

People are often very reluctant to commit to print what they feel and this may account for the rather large number of outstanding references in Mosel and Goheen's study, a situation which any person involved with selection must be all to familiar with. On the other hand, telephone conversations are often extremely revealing when referees are rung up and asked to give their impressions of a candidate. This situation could be altered, however, if referees think or know their comments are being written down. It is also possible that verbal comments could be made with even less care than written ones.

Browning (1968), in a similar study to that of Mosel and Goheen but conducted on teachers, correlated two thousand, two hundred and twenty one ratings by 11 different reference sources with a criterion of job success, which was a combined total of a five factor performance rating by the principal of the school. The validity coefficients obtained ranged from -.03 for the poorest source to .23 for the best source. The latter turned out to be the teacher's last supervisor. The average validity coefficient obtained was .13.

Another problem with references is highlighted by Browning's (1968) study and that is who gives the reference. Generally the choice is left to the applicant for a job, and obviously as Myers and Erret (1959) found, they tend to select people who will evaluate them positively. It is unlikely for example, that a testimonial would be anything but positive. The selector only becomes suspicious if one is not presented at all.

It would seem that much of what can be concluded at present about references is rather negative, a view supported by Muchinsky (1979) in his review, but the problem seems to lie with what is aked in references and the lack of care in constructing the questions asked of referees. The problem is not so dissimilar to the psychometrician's concentration on predictors at the expense of criteria. In the latter case, predictors get discounted not necessarily because they in themselves are invalid and lack reliability, but because they are compared to criteria which in many cases are very unreliable and inappropriate. So in the case of references, if referees are simply asked for a general reference as is so often the case there is little motivation for them to take much care in responding since the request is made in rather a vague way. However, if questions are asked which relate to motivation and morale, more differentiation between candidates could be obtained. A good example of a study using care in the questions asked is that of Carrol and Nash (1972). They used a forced choice format on a reference questionnaire which was used for the selection of clerical workers. The forced choice format is useful in this context because it presents the referee with sets of favourable phrases. In each set the referee is required to choose the ones that are most descriptive and least descriptive of the person being rated. The technique therefore reduces the halo effect for it forces the referee to choose between equally desirable characteristics in describing a person they like. Certainly, in relation to the 50 references in Mosel and Goheen's study, the method would have been useful. Carroll and Nash found that after correction for the effects of five moderator variables (sex, longevity, job congruity, nationality, and race) the best subsets of items gave validity coefficients of .64 and .56 against a supervisory performance rating criterion. The forced choice technique would seem to be very suitable for reference checks and it is surprising that it has not been developed further. A case again perhaps, of good applied psychology not being practical psychology.

The way that references are used at present leaves little doubt that the lack of confidence most users of selection methods have in them is probably justified. This is in great contrast to the confidence expressed in interviews as methods of selection, as typified by their continuing widespread use. The reason for this difference of confidence probably lies in who is making the assessment, the person in charge of the selection process or an outsider such as a referee. Criticism of one's own ability to judge comes less readily than criticism of another person's ability to make judgements about the abilities of other people. References, like the interview, are therefore likely to continue to be used but more out of habit rather than a belief that something useful can be obtained from them, when in fact a well designed reference questionnaire using a forced-choice format could considerably improve validity coefficients for references.

3.12 The Different Uses of Application Forms

Perhaps the greatest confounding factor in relation to validating the interview is the application form. In real life, interviews are rarely conducted without some information about applicants and this information is usually provided through an application form. The application form in this case is used as a basis for the interview so that structure can be provided for the interaction. The interviewer theoretically then makes an informed assessment of the candidate's suitability for the job. If used thoughtfully the application form is a very reasonable method of structuring the interview. However, there is a danger of the interview developing into a confirmatory procedure for what is contained on the application form in that interviewers may just collect the same data, usually of a biographical nature, that it provides. This process has occurred in the early stages of interviewer training courses conducted by the author and, undoubtedly, frequently happens in the often necessary expediency of everyday selection interviewing, when interviewers are sometimes unprepared.

Application forms can be used in other ways. The most common is to use the procedure as a method of removing those candidates who are unsuitable because they do not meet the minimum standards set by the organisation or the law. For example, the organisation might require school certificate as a minimum educational requirement for an occupation and if the job were that of a driver the organisation (ultimately the government) would require evidence of an appropriate licence, either an ordinary driver's licence or heavy goods vehicle licence or public service vehicle licence, depending on the job. This sort of information is usually obtained using a small number of questions which means that if an application form is designed specifically for this purpose it can be designed easily and cheaply. This rarely occurs because organisations generally use the application form as a method of structuring the interview and as a preliminary screen to establish those who possess and do not possess the necessary basic qualifications. Thus the application form becomes longer than it should be if it were used purely for elimination purposes. It is possible on the other hand that making application forms long could be an advantage because people would be discouraged from completing them unless they were serious about applying for a job.

3.13 The Actuarial Weighting of the Application Form

The third major way that application forms can be used is actuarially. The actuarial method involves coding the data available on the form in a numerical way, then using it in combination with all the other items on the application form to predict a criterion of some sort such as productivity absenteeism or turnover. The combination method used is always statistical and usually involves multiple regression or discriminant analysis, hence the name actuarial. In this method the distance from work candidates live, or the number of dependents they have is treated in the same way as an assessment of performance in the interview or a score on a test. Ahern (1949) has provided a list which could be used to decide whether items should be included on an application form or not. The principle is that if an item cannot be justified on the basis of a positive answer to at least one of the questions, it should be rejected. The questions are shown in table 3.5. Researchers in the area often differentiate between 'obvious life history items' and those items which are not so obvious (Glennon Albright and Owens, 1966, Owens 1976). This differentiation is, however, ambiguous for they say items such as age, education, number of brothers and sisters and parents' occupations make up the former category and questions such as "Were you viewed positively by most of your high school teachers?" "Were your parents happy with your schoolwork?" and "Were you considered a 'joiner' in your circle of friends?" make up a category generally called biodata. This description of the latter category as biodata is not particularly helpful since the more obvious life history items also fall into a category of biodata which is often classified with biographical data. It would be fairer to say that these "biodata" items are more similar to the personality test questions found on such tests as Cattell's 16PF. (Cattell Eber and Tatsuoka, 1970) or Eysenck's EP1 (Eysenck 1959). A reasonable argument could be made that when questions are framed in this sort of way the application form is acting as a postal personality test, with all the limitations that these standardised tests possess. There is the added problem of being sure that the candidates themselves are completing the items,

1. Is the item necessary for identifying the applicant?
2. Is it necessary for screening out those who are ineligible under the company's basic hiring policies? Specially, what policy does it pertain to?
3. Does it help to decide whether the candidate is qualified?
4. Is it based on analysis of the job or jobs for which the applicant will be selected?
5. Has it been pretested on the company's employees and found to correlate with success?
6. Will the information be used? How?
7. Is the application form the proper place for it?
8. Will answers provide information not obtained in another step in the selection procedure - for example, through interviews, tests or medical examinations?
9. Is the information needed for selection at all, should it be obtained at induction, or even later?
10. Is it probable that applicants' replies will be reliable?
11. Does the question conform to any applicable government legislation?

Table 3.5 A checklist of questions to decide on the merits of including particular items in application forms (Ahern 1949) since application forms are usually completed before candidates come for an interview. The issue of giving candidates material by mail for completion at home is an important one because of the time and expense that can be saved by adopting such a procedure. It will be discussed further in a later chapter.

One of the earliest references to an empirical evaluation of biographical data for selection purposes comes from the area of insurance. Insurance was quick to use actuarial "scientific" methods for determining life insurance policy premiums. Colonel Thomas L Peters of the Washington Life Insurance Company of Atlanta carried this principle into the area of selection by proposing that one way of improving the selection of life insurance agents "would be for managers to require all applicants to answer a list of standardised questions such as the following: present residence? Residences during the previous ten years? Birth date and Place? Marital status? etc." Peters went on to say that such a list had already been used by his associates in the Georgia Association of Life Insurers (Ferguson 1961). As is the case with much of the history of applied psychology the Great War provided an impetus for much research and the empirical evaluation of the application form was no exception. The culmination of this work came in 1922 when Goldsmith (1922) published an article specifying the nature of item analysis and weighting in relation to application forms. Since then a large amount of research has been conducted using an empirical assessment of the application form usually using sales positions and the dependent variable of turnover.

A typical study would be that of Cascio (1976) who looked at the relationships between biographical data and job tenure. Cascio attempted to predict employees who would stay with an organisation for over a year. He used age, marital status, previous salary, tenure on previous job, presence of a friend or relative in the company, location of residence, home ownership and length of time at the present address as predictor variables. He conducted the study on a minority group and a sample from the general population. He also conducted a cross-validity study using similar independent groups to check his results. Table 3.6 shows the results he obtained on his sample of women.

	Validity Coefficient	Cross-Validity Coefficient
Majority Sample	.77	.56
Minority Sample	.79	.58

Table 3.6 Results of a crossvalidity study using an application form to predict labour turnover (after Cascio 1976).

These results not only confirm the value of the application form for predicting labour turnover but also suggest that it does not penalise minority groups, a factor which is of increasing concern for selectors who have to contend with increased amounts of legislation such as the New Zealand Human Rights Commission Act and Britain's Sex Discrimination Act.

Some of the difficulties associated with the interview and references as methods of selection, centre around whether candidates are truthful or not. Cascio (1975) in a study of police department application forms in Florida found a very high relationship between fact and self report. The median correlation between the applicant's answer and the verified answer was .94. Unfortunately the study is flawed because candidates were aware that their responses were going to be checked. In most employment situations a check is not carried out and candidates generally could be confident that a check would not be done. If this were the case the correspondence between self report and the truth would be substantially different. Cohen and Lefkowitz (1974) looked at distortion on biographical items and items from a personality test, the MMPI (The Minnesota Multiphasic Personality Inventory). They were able to show that there were good correlations between the distortions on biographical items and questions from the personality test. If one is using biographical data for empirical prediction it would seem that it is vital that candidate's responses be checked, if only on a random basis. This could, of course, be quite an onerous task if there were a large number of candidates. Consequently, it may be that the application form when used empirically, has serious drawbacks if it is to be used by practitioners. There is considerable doubt whether the pressure of a management position would allow time for practitioners to make checks of the truthfulness of application form data.

The application form when analysed empirically has therefore shown a very consistent relationship with a wide variety of criteria. Ghiselli (1966) showed that when validities were averaged across a number of jobs, personal data predictors led all the rest. (N.B. The comparison did not, however, include work samples). Their average correlations with criteria of trainability and proficiency were .44 and .41 respectively. However, there are two problems which make it unlikely that weighted application forms will be used widely; they are the technical knowledge required to implement their empirical use and the lack of durability of validity coefficients over time, which could be a problem for many selection methods, and the situational specific nature of any weightings obtained. The latter problem makes it an onerous task if the form has to be redesigned and reevaluated for each location and, if the dependent variable is labour turnover, it seems that a considerable time would elapse before a sample of "leavers" could be given a redesigned application form, because of the time required to distinguish between the leavers and the stayers. On the durability issue, Roach (1971) has shown a substantial loss in the prediction of tenure of clerical employees of a previously cross-validated application form. It was suggested that this change in efficiency was due to labour market conditions, manpower needs and personnel policies.

On the other hand, Hinricks Haanpera and Sonkin (1976) were able to show that the same questionnaire provided highly valid coefficients, using application forms for predicting sales success in a number of different countries. The same questionnaire and the same weights were applied to each country and significant results were obtained for the prediction of success in Swedish, Finnish, Norwegian and American sales personnel. It would seem that the research evidence in favour of the transfer of one weighted application form to another setting must depend on the nature of the job and the criteria used. The situation is, to say the least, somewhat equivocal. A comprehensive review by Owens (1976) concludes that "All in all, the available evidence seems to suggest that the major dimensions of biodata response are quite stable across culture, age, race and sex groups" and that the application form has the "...potential to be valid in many situations." In their review of personnel selection techniques, Ash and Kroeker (1975) express surprise that little research had been conducted on the use of biodata in the actual employment situation since the last review. They go on to say that "One possible index of dwindling interest was the experience of the authors of the Catalog of Life History Items (Glennon Albright and Owens, 1966) who invited reports of validation studies of the items: not one study has been received."

The possible reason for the lack of research is the technical knowledge and time required to implement such a thing as a comprehensive analysis of a purpose built application form. Using the terms previously defined, it can be said that the empirical evaluation and use of the application form through weighting is applied psychology and not practical psychology.

Nevertheless, the application form does possess face validity for selection purposes and it is not unreasonable to guess that in selection situations practitioners would be tempted to use the information on the form in a clinical way. There is no real evidence that clinical evaluation of application forms has any predictive or concurrent validity. Analyses of application forms by Lipsitt Rogers and Kentner (1964) for example isolated "energy", "orality", "aggressiveness" and "narcissism" but they indicate no predictive validity for these "factors".

It would seem then, that despite its great potential, the sophisticated empirical weighting of the application form will not find wide application in industry for some time unless a method can be found to remove it from the realm of applied psychology and into a form digestible to practitioners.

Chapter 4
TESTS AND ASSESSMENT CENTRES

4.1 Forms of Test used in Industry

Testing as a method of selection has become increasingly popular over the years not only for managerial positions but through the whole spectrum of work. An idea of the expansion in the use of tests is given by Scott Clothier and Spriegel (1961) who looked at the reported use of tests in the United States between 1947 and 1957. In 1947 57 percent of companies reported that they used tests for selection: in 1957 this had increased to 80 per cent. It is still unlikely that the amount of testing has surpassed that of interviewing, mainly because of the easier implementation of the latter.

Since work contains an infinite variety of skills, so all forms of tests have been used to try to predict behaviour at work. Many classification systems for tests have been devised to group the large number of tests that exist. Probably the most useful of these classification systems is that which focuses on the type of behaviour the tests were designed to measure. Generally there has been little argument concerning the categories into which the tests fall, and they can be summarised as: tests of intellectual abilities, tests of spatial and mechanical abilities, perceptual accuracy tests, tests of motor abilities, personality tests, and interests tests (Ghiselli and Brown 1955, 1966, 1973, Blum and Naylor 1968, Cronbach 1970).

The development of testing has had one positive effect on the selection of people for work. The variety of different behaviours measured by tests has tended to force managers to think more carefully what they are selecting for, while interviews, references and application forms, on the other hand, do not impose these same demands. This has caused a greater emphasis to be placed on the development of job analysis, so that appropriate tests for specific jobs are chosen. There will always be those practitioners, however, who believe that seemingly inappropriate tests, such as those of personality, can account for a significant part of the variance in jobs of a manual skilled or semi-skilled nature, such as fitting or operating industrial sewing machines. The psychological evidence contradicts this belief (Hogan 1972, Smith 1968).

Job Analysis is vital, not only for making the choice of the best predictor or group of predictors, but also for criterion development, which merits a separate treatment, and will be discussed later.

Unfortunately, a job analysis cannot always be the total answer for the people who have to choose tests, because tests in general (excluding work samples) attempt to measure 'pure' factors as defined by Burt (1941) Thurstone (1947) and others, while the practitioner is always left with the difficult problem of deciding whether a particular test is appropriate for the job under consideration.

4.2 Intelligence Tests

A good example is the classification category of intellectual abilities. Tests of intelligence are often given by practitioners because even though they have considered the content of the job there is a vague feeling that intelligence must be related to most work in organisations. It is only rarely that practitioners would say that a job does not demand intelligence, and even then it is argued a test of intelligence could be useful as a measure of employability. Or it may be used to help applicants with lower intelligence to be recruited, who would be more likely to remain with the organisation in a job to which they are matched.

There are a number of problems associated with the general assumption that measuring intelligence is a good thing. First of all is the difficulty psychologists have had getting some agreement about the nature of intelligence. Some for example, have argued that creativity is part of intelligence (Getzels and Jackson 1962, Hudson 1962). If it is, then a powerful argument can be made that many of the tests of intelligence appear not to include this dimension. Also, as Ghiselli (1973) has shown, there is no reason to suppose that intelligence is the only or even the best predictor of performance at work. Table 4.1 from Ghiselli's paper illustrates this point well, with the tests of intelligence not really showing any significant improvement over other measures.

There is no real reason to suppose that tests of intelligence tap the only or even the most important dimension for success in many jobs. As Bartlett (1947) so eloquently put it "...nearly every

	Machine Tenders	Bench Workers	Inspectors	Packers and Wrappers	Manual Workers
Intellectual abilities	.21	.18	.21	.18	.22
Intelligence	.21	.18	.23	.17	.21
Immediate memory	.17	.06	.14	.24	-
Substitution	.19	.12	-.01	.16	-
Arithmetic	.21	.20	.24	.16	.24

The sample sizes were not equal.

Table 4.1 Validity coefficients for five different sorts of work and some psychological tests (adapted from Ghiselli 1973) practical decision of any importance depends upon a number of factors, some of which are matters of feeling rather than of rational thought. The excellence or otherwise of a person's practical judgement cannot, therefore, be predicted merely from a knowledge of his standing on formal intelligence tests. In short, the tests sample but a limited and arbitrarily selected range of capacities under highly artificial conditions". The increasing complexity of work makes that statement even more true today than it was then. Intelligence tests can be applied and indeed can be seen to be acceptable by practitioners, but their rather narrow and somewhat artificial definition of intelligence precludes their acceptability as practical psychology.

4.3 Personality Tests

As has already been mentioned, personality tests despite their problems are a popular method of selection (Hesketh 1974). Their popularity is not difficult to understand in relation to the pure psychology/practical psychology continuum. The tests have considerable face validity, because in managerial positions practitioners rightly believe that specific personality dimensions are very important to carry out these sorts of jobs effectively.

If we accept that the major function of managers is to make decisions, then it is possible to break down the decision making function into two distinct areas. Firstly, a manager needs the technical knowledge to be able to follow the arguments presented by any situation, and second, the manager requires an ability to get his peers and subordinates, and sometimes even his superiors, to carry out this decision. This latter ability is what practitioners hope a personality test will predict.

Practitioners once they are aware of the existence of tests are often impressed by the way tests assign numbers to people in an "objective" way. Unfortunately a lack of appreciation of the concepts of reliability and validity often makes an unsophisticated test user read scores too literally . An example would be when two people with a difference score of one on the dimension of extraversion on a personality test are regarded by the unsophisticated test user as being significantly different in the amount of extraversion they possess. This of course is not true, but for the practitioner, one of whose idiosyncracies, according to Miller and Rowe (1967), is the reduction of the number of candidates through the accumulation of unfavourable information, it could lead to the erroneous preference of one candidate over another, using error variance.

The 16 PF (Cattell Eber Tatsuoka, 1970), the most used test in New Zealand industry, has been criticised because of its unstable cross-cultural factor structure (Adcock 1974). As a result of this unstable factor structure Bull (1974) asks "Should the 16 PF be used in Personnel Selection?"

The appeal of the 16PF continues unabated primarily due to the attractiveness of measuring personality, but little attention is paid by users of the test to the accuracy of this measuring instrument or even to the existence of the dimensions measured. The popularity of the 16 PF in New Zealand is in part due to its use by firms of consultants like Sheffield Associates, who require a general measure which they can apply to a wide range of managerial jobs. It is worth emphasising at this point that practical psychology techniques need reliability and validity, as well as face validity and ease of application.

The 16 PF in particular has even been made more appealing by the authors introducing a shortened version for industrial use (Form D). The very existence of this version of the test must make even more questionable the validity of the 16 PF. On page 41 of the 1970 Handbook to the test the authors (Cattell Eber & Tatsuoka 1970) in defending the use of the full test on individuals say ".. they (critics) have overlooked the fact that the full 16 PF, as advocated for general use, is not just the single isolated form whose reliabilities are set out in the table". It seems that the authors favour the use of the two versions of the test together. The existence of a shortened version seems somewhat contradictory if one form of the longer version is not recommended for individual use. It would appear that the designers of the 16 PF have succumbed to the pressures of practitioners.

Criticisms of personality tests for personnel selection do not rest on the 16 PF alone. For example Palmer (1974) looked at the Gordon Personal Profile and the Gordon Personal Inventory (Gordon 1963) and concluded "The investigation showed no support for the hypothesis that management effectiveness as evaluated by subordinate managers is a function of the personality characteristics of the individual as measured by the Gordon Personal Profile and the Gordon Personal

Inventory".

The problems of deception when the questionnaires are used are recognised by the necessity of a lie scale on tests such as the EPI (Eysenck and Eysenck 1964) and a sabotage index for the 16 PF (Cattell Eber and Tatsuoka 1970). O'Dell (1971) has even proposed a method for detecting random and careless responses on such tests. Nevertheless, the problem is still acute, for the 16 PF contains three direct questions about accuracy of responding (Numbers 1, 2, and 187). Some of the other questions in the test are so very general that one could expect people to be uncertain about their accuracy of responding, which in turn could cause some problems in interpreting the questionnaire as a whole.

Personality testing does have its defenders. Hogan, De Soto and Solano (1977) have enumerated the main criticisms of personality tests and have responded to them, but the arguments revolve around opinion and approaches to research rather than that personality tests have been unjustly treated as far as their usefulness for personnel selection is concerned. Jackson and Paunonen (1980) in their review of 'Personality Structure and Assessment' make the point that personality tests have some utility by citing the work of Meyer and Pepper (1977) and Alker and Owen (1977). The former study discovered the degree to which the marital adjustment of young couples could be predicted by a knowledge of the similarity of their need structures, as measured by conventional personality items. The latter study used self report, trait, behavioural sampling and biographical information measures as predictors of performance in graduation from a military training program. The marriage adjustment study of Meyer and Pepper can be discounted as evidence for the value of a personality test in an industrial setting because given the circumstances of the study there would be less likelihood of deception in response to the personality questionnaire items. The Alker and Owen study uses the personality test as part of the predictors of success in the training program. Substantial variance was accounted for by the biographical data, as might be expected from the earlier discussion. All that can be concluded is that under some circumstances personality tests may be suitable to include in a battery of predictors. This does not help the practitioner, because a battery of predictors may be necessary from the standpoint of applied psychology, but would be unacceptable for practical psychology. Practitioners by and large are unwilling to spend large amounts of time on selection.

4.4 Projective Tests and Selection

Projective tests were originally developed by clinical psychologists to analyse the abnormal personality. Their use in New Zealand is probably not large but certainly, as can be ascertained from the literature, they have been used in other countries most notably in the United States. Kinslinger (1966) surveyed the use of projective techniques in personnel psychology from 1940 to 1966. He concluded that their value for selection was debatable.

Some studies have shown some positive validity coefficients for projective tests and industrial criteria. Cummin (1967) and Wainer and Rubin (1969) have used the Thematic Apperception Test (TAT) and scored it for need for achievement and need for power. They discovered significant positive correlations with executive success. Grant Katkovsky and Bray (1967) gave three projective tests to a group of 201 managers and found that several ratings of variables correlated significantly with a criterion of salary progress seven to nine years after original assessment.

These tests are administered using a face to face interaction and consequently they are similar to the interview. It may well be that projective testing, when carried out well, isolates the same dimensions as the well conducted interview. Projective tests in the hands of the untrained are however likely to be abused. Arguments have already been made about the poor use of the interview and it is likely that the same fate would exist for projective techniques.

In New Zealand, projective tests could never be widely used because of the severe restrictions imposed by the national psychological society, in common with other countries, on the availability of such tests. In practice it means that the tests have to be administered by a psychologist who has been specifically trained in their use. This does not, of course, prevent individual organisations inventing their own tests and using them, which for practitioners attracted to the method would not be impossible.

It would seem that the accurate measurement of personality would be of immense value in personnel selection because of the available proof that practitioners are attracted to techniques that purport to measure it. Unfortunately it now seems that even if acceptably reliable and valid personality assessment techniques are found, they will have to compete in their appeal with the rather poor tests which already exist. For this reason there are strong doubts whether formal personality assessment can be regarded as practical psychology.

4.5 Mechanical Reasoning Tests

Many jobs involve the understanding and use of mechanical equipment. In an attempt to predict performance on these skills, psychologists have developed tests of mechanical reasoning which involve the pencil and paper manipulation of concepts. Superficially these tests have a reasonable face validity for these sorts of tasks, but there is danger in assuming that they can be predictive of all forms of mechanical tasks. This is because the skills involved in any single manual occupation can be unique in terms of the varying amounts of independent skills that make up an individual task. The independence of different skills has been shown in a number of studies, most notably those of Fleishman and his colleagues summarised in 1962 (Fleishman 1962). They concluded that there are eleven reasonably independent groupings of motor skills. Their precise nature is unimportant for the present argument, but the evidence that they are independent suggests that it is unlikely that a single mechanical comprehension test would be suitable for the prediction of jobs involving all manual skills, although the face validity and ease of presentation of these tests suggests this might be so. Our main concern is managerial selection, however, and it is rare for mechanical comprehension to play an important role in such tasks. If through a job analysis of a management position elements of motor skill were isolated, there are superior methods of predicting performance in this area which will be discussed later.

4.6 Apparatus Tests

Other attempts at predicting manual skills in jobs have moved away from a pencil and paper approach to the problem to one of using standardised apparatus. Examples of this sort of test are the Purdue Pegboard (Tiffin 1948) and the O'Connor Finger Dexterity test (Hines and O'Connor 1926). Again these tests only really measure a small number of motor skills, and are not very useful because of their specificity, and the tendency of most skilled jobs to contain elements of the skills identified by Fleishman (1962) in varying proportions. There is also some doubt about the reliability of the tests. A study by Corlett Salvendy and Seymour (1971) considered the reliability of the O'Connor and Purdue tests and concluded "(The tests) are inherently too variable to constitute adequate tests of speed skill acquisition". Anastasi (1976) probably best sums up their status "With regard to commercially available motor tests, the functions they measure are very simple, and their validities against most criteria are not high. For this reason such tests can serve best as part of a selection battery, rather than as single predictors." If the jobs are of a manual nature, any such battery could become unnecessarily long and unacceptable in an industrial context. Again applied psychology, while providing something seemingly operational outside the context of the organisation, does not provide something that fulfils the demands of practical psychology, and the constraints under which people have to work.

A logical progression from a consideration of apparatus tests is a discussion of developments in the area of work sample tests which have largely replaced apparatus tests as means of selection for motor skills. This discussion however is reserved for the next chapter because its importance to the theme of the present thesis merits a separate analysis of the research on work samples.

4.7 Assessment Centres

As has already been observed it is unusual for any selection method to be used in isolation. Interviewers nearly always use application forms, and the necessity for the physical presence of candidates when they sit most tests makes an interview highly likely. A formal extension of this multi method approach called the assessment centre has developed over the years.

Finkle (1976) in his review has observed that assessment centres have certain common elements. They use multiple methods which, perhaps, in some ways makes them little different from many conventional selection procedures. Generally the differences appear in the manner in which selection takes place, because in the assessment centre selection is usually done in groups and by groups. It is not uncommon perhaps for selection to be done by groups, but it is certainly still unusual for selection to be done in groups.

Assessment centres also possess considerable face validity. Finkle (1976) regards this as the "most striking characteristic of assessment centres". This appeal is important, as has already been discussed, if any technique is to gain wide acceptance in industry.

4.8 Validity and Reliability of Assessment Centres

Research by Greenwood and McNamara (1967) and Thomson (1970) supports the conclusion that behaviour observed in assessment centres can be rated with good interrater reliability by assessors. Validity studies of the assessment centre have included job progress, job performance, and job potential among the criteria. The research shows that assessment centres can be quite effective in predicting success using these criteria. Validity coefficients have generally ranged from .3 to .6 (MacKinnon, 1975). This compares very favourably with the validity evidence for other selection methods.

Assessment Centres use many selection methods to allow the strengths and weaknesses of applicants to be matched with the requirements of jobs in organisations. Management consultants have organised assessment centres for client companies, thus allowing small organisations, who would otherwise not have access to such a technique, the opportunity to assess individuals for positions in their organisation.

Criticisms of Assessment Centres have centred around the lack of care with which the centres are conducted. It must be remembered that the centres, as such, contain nothing that is specifically new to selection. Assessment Centres are a method of formalising the extra time that organisations are often reluctant to provide for the adequate assessment of applicants. Grouping the many methods of selection in an assessment centre encourages employers to allow more time to be spent on selection, which they otherwise might not allow if they were told that the valid selection of personnel required the individual use of the methods used in the assessment centre. This also has great appeal for consultants who see the possibility of larger fees through the assessment centre approach. Dunnette and Borman (1979) are concerned that the "rapid growth of assessment methods may be accompanied by sloppy or improper application of assessment procedures". This has occurred before with the great harm caused by the application of sensitivity training on a haphazard basis in the 1960's. It has to be remembered also that many of the individual selection methods such as selection interviews, used in assessment centres, if not used with care, are suspect.

It is perhaps pertinent at this point to ask whether assessment centres are applied or practical psychology. There is little doubt that when they are well conducted they are the most promising system yet devised for the selection of managers. From the point of view of practitioners, however, they have two major disadvantages: the time they take, and the requirement that if any sophisticated tests are used, legally a psychologist is required. Concerning the first disadvantage, Wexley and Yukl (1977) observe that assessment centres can be quite inexpensive or costly depending upon their length, location, and number of participants. There is the difficulty that much of their success may be dependent on the amount of time they take up, because the more time there is available the more time there is to obtain typical behaviour from individuals. This in turn must lead to the possibility of better prediction of success on a job. If the amount of time an assessment centre takes is cut, as a cost saving measure, or because of the failure of a practitioner to appreciate the importance of a number of samples of behaviour to make accurate decisions, the effectiveness of the assessment centre approach could be severely curtailed.

From the point of view of the practitioner in industry, calling in a psychologist has a disadvantage, not necessarily because of its cost, although this is a factor, but more because of the inconvenience of having to do so each time some selection has to be done. There is also no tradition in New Zealand of using psychologists for selection. No empirical evidence is available to support this, but the widespread use of selection methods of dubious validity, such as the interview is perhaps some indication. There could be some expectation that its use would be less if psychologists had more influence in industry.

It would appear that on balance these two factors, at present, prevent the assessment centre being practical psychology. Even if it does have face validity, and is acceptable, there is a good chance that this powerful approach might be watered down by practitioners.

CHAPTER 5

WORK SAMPLE TESTS

5.1 Work Sample Tests and Selection

It was shown in Chapter 4 that apparatus tests have severe limitations as far as their usefulness for selecting for jobs involving motor skills is concerned. This is caused largely by the individual nature of most skilled jobs because of the way different motor skills are quite distinct from one another (Fleishman 1962). This results in no one apparatus test being suitable for all motor skills.

Apparatus tests for the testing of motor skills have in large part given way to work sample tests, which are being increasingly advocated in the literature. The work sample literature appears to be divided into two distinct parts. There are researchers, such as Frederiksen, who advocate use of in basket tests not only as a method of selecting managers but also as a method of training them (Frederiksen 1962). Another group typified by Schmidt and his colleagues (1977), is advocating the use of work sample tests for selection in the area of motor skills. As Robertson and Downs (1979) point out in their promotion of the rather unique trainability testing approach, the aims of the two groups are similar, for they are both suggesting that a higher point to point correspondence between a test and the job it is trying to predict will lead to improved predictive validity coefficients, and increased face validity for clients and practitioners alike.

A number of studies support the use of work sample tests in the motor skills area. Following arguments presented by Wernimont and Campbell (1968) that it would be fruitful "to focus on meaningful samples of behaviour, rather than signs of dispositions, as predictors of later performance" Campion (1972) demonstrated that work sample performance was significantly related to foremen's evaluations of job success, whereas traditional paper and pencil tests were not related. Subsequently Muchinsky (1975) has found work sample tests to be predictive of the on the job performance of mechanics, and research by Mount Muchinsky and Hansen (1977) found that in their study, despite the comparability of predictive validity coefficients for work sample and paper pencil tests, more interest and motivation is generated by the work sample tests because of their perceived relevance to the work it is intended to predict. A review by Asher and Sciarrino (1974) provided a summary of the validity of a number of work sample tests in various situations. They divided the studies into two groups based on the nature of the tests; one group was classed as motor tests and another as tests involving anything dealing with verbal concepts. The verbal concepts category included a diverse number of instruments such as tests about farming, tests of chemical information, tests relating to police work and in basket tests. The results (see figure 5.1) showed that the motor tests generally had higher validity coefficients than the 'verbal' work samples did. The two different sorts of test also had apparent differences between them on the sorts of criteria they were best at predicting, the motor tests proving better at predicting job proficiency criteria and 'verbal' tests proving better at predicting training criteria (measures of learning during training). It could be that

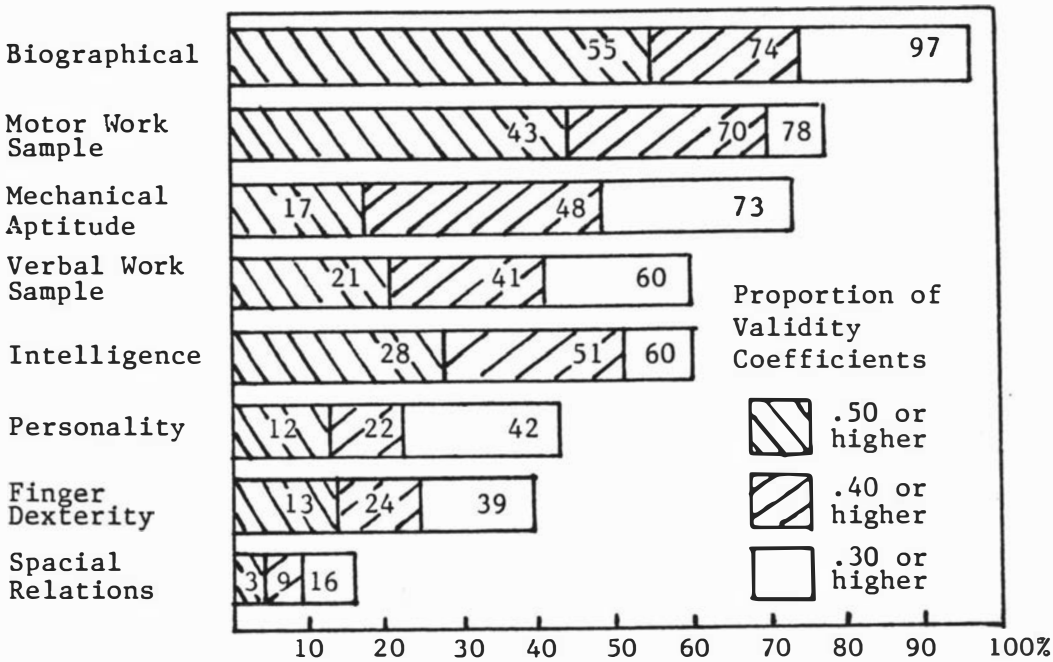


Figure 5.1 Proportions of validity coefficients of various magnitudes with job proficiency criteria for eight types of predictors. (From Asher and Sciarrino 1974).

the verbal tests were more related to general intelligence than the motor tests. It might be expected that intelligence would be related to progress in learning. This is supported by studies on the prediction of scholastic performance using intelligence tests such as those by Entwistle and his colleagues (Entwistle et al 1972, Entwistle 1974). The explanation for the difference in the size of the validity coefficients between the two types of test could be the degree to which each type was a representative sample of the job they were being used to predict. In the case of motor work samples it is proposed that the motor tests were more likely to be similar to the job on which they were attempting to predict performance. This could be because of the rather more 'contained' nature of most motor skills. For example it is much easier to construct a test which would be representative of the motor skill of sewing machining than attempting to construct a test of the knowledge required to cover police work. A test about the knowledge required in police work would also suffer the disadvantage that it would not cover dimensions such as 'dealing on a personal level with people' which almost certainly would be regarded as important if a job analysis was conducted of a police constable's job. Other forms of 'verbal test', such as the in basket test, because they can be based on a job analysis might be more representative of a specific job and consequently would be better at predicting performance on it.

An extension of job samples in motor skills called trainability testing was first described by Downs (1968). She summarises this procedure "The test is administered by a specially trained instructor.

1. Using a standardised form of instruction and demonstration, the

instructor teaches the applicant the test task, chosen because it incorporates essential elements of the work for which selection is being made. During the teaching period the applicant is free to ask questions.

2. The applicant is asked to perform the task unaided.

3. The instructor evaluates the applicant's performance by noting all errors on a standarised error check list and by making a rating of the applicant's likely performance in training, usually on a five point scale.

4. The applicant's test result is compared with expected results for successful applicants; if his result falls below the cut off point decided upon in the light of previously validated results, he is rejected; if he comes above it he is accepted for training."

Downs found this type of selection particularly suitable for older people and for immigrants, especially those wanting to learn an entirely different skill from those they had previously used. Trainability assessments have since been used in a wide variety of jobs from shipbuilding to sewing machining with validity coefficients consistently higher than paper and pencil tests (Downs 1972, 1973, Smith and Downs 1975, Smith 1977, Colbeck 1976).

5.2 Clerical Tests

Clerical tests have been designed to assess the ability of people to accurately check items as quickly as possible. They were originally designed to assess the aptitude of people for clerical jobs. From this perspective, although the occurrence is accidental rather than intentional, they can be regarded as a form of work sample test.

The number and diversity of duties in clerical jobs would be thought to be high, but job analyses of general clerical work showed that a large proportion of time was taken up in these jobs carrying out checking tasks (Bennett and Cruikshank 1949). From the point of view of the work sample approach it could be said that there is a high point to point correspondence between what clerical tests measure and what clerks do in their work.

The predictive and concurrent validity of these tests have been found to be reasonably good for many clerical positions. Ghiselli (1973) reports some validity coefficients in the 40's. In a research exercise for the Trustee Savings Banks in the United Kingdom, Smith (1974) designed clerical tests specifically to select bank clerks for this bank using a work sample approach. He obtained significant concurrent validity coefficients for the tests. The test itself differed little from standardised paper and pencil tests such as the Minnesota Clerical Test (Psychological Corporation 1947), thus further illustrating the similarity between clerical tests and work sample tests. Consequently the conclusions concerning the stature of work sample tests in practical psychology also apply to clerical tests.

5.3 Work Sample Tests and Intellectual Skills

Work samples or their variants have not been exclusively used for the selection of people for jobs involving motor skills. They have also been constructed for predicting performance in work of an intellectual nature. Lafitte (1954), for example designed Melbourne

Test 90 which he described as "an examination paper with two questions and no time limit". The test is a role playing exercise in which candidates in the first question have to play the part of a businessman and make a decision about buying an island giving reasons for the particular choice they make. The second part of the exercise is an extension of the first. During the construction of a holiday camp on the chosen island, difficulties arise and the candidate has to decide what to do about the project as a whole. Lafitte designed a marking procedure for the test based on the reasons given for a particular decision and their suitability given the problem. He found that the test was extremely good at predicting future academic performance of University Students reading a variety of subjects.

5.4 In Basket Tests

Frederiksen (1957) took this idea of role playing one step further in his design of an in basket test. Since Frederiksen's original work, a number of such tests have been designed but they all involve essentially the same idea. An executive returns from a holiday or after an illness to his or her office and is faced with a large in-tray of items. The items would be of many types and it is the candidate's job to respond to a question such as "what will I do". Candidates are also provided with a good deal of background material giving details of the organisation and its philosophy. A brief job description is also included together with an organisational chart showing the position in the organisation of the person the candidate plays.

Frederiksen makes the point that other attempts have also been made using situational tests to select potential managers. The Civil Service in Britain for example have used tests for this purpose, but their approach has been to use group problem solving exercises and evaluate the contribution of individuals to the successful problem solution. The in basket test is a paper and pencil test which can be given to groups, and it is in this way that it differs from the "group selection" approach used in the British Civil Service (Anstey 1977).

As Gill (1979) reports there have not been a large number of attempts to validate the in basket test on actual on the job performance. Wollowick and McNamara (1969), however, have shown that an in basket test does predict a criterion measure and a number of studies have suggested that it makes a valuable contribution to predicting managerial performance (Bray and Grant 1966, Holdsworth 1973, Ungerson 1974). Meyer (1970) comments that the paucity of validity studies is probably due to the high face validity of the instrument, in that it looks as if it should predict performance, so there are few attempts to verify this.

5.5 Work Sample and Other Test Design

There are some fundamental differences between the ways traditional standardised psychological tests and work sample tests are designed and constructed. While paper and pencil tests usually measure some psychological construct, work sample tests attempt to measure those skills that are required for a job. There has developed in the literature some set procedures for the construction of standardised paper and pencil tests (Anastasi 1976). These procedures involve such steps as the development of an item pool and item analysis and a comparison to other tests that purport to measure the same psychological construct. In common with all tests some indication of validity and reliability is also required.

Work sample tests, in contrast, cannot in the same sense be regarded as having items. Certainly there are different letters, messages and memoranda supplied with an in basket test, which could be regarded as items, but there can be no equivalence between these items: they do not individually measure the same thing. On an intelligence test there is a conscious effort on the part of the test designer to ensure that items do measure the same psychological construct even if some items are more difficult than others. When work samples are designed their main focus is a job or a type of job, and for this reason they do not have items. This is most clearly seen in manual task work samples, where it is impossible to pick on any element of, for example, the fork lift truck trainability assessment (Downs, 1972) as being an item. The assessment as a whole is a carefully constructed sample of the job performance which the researcher wants to predict, and is not designed with items in mind at all. In basket tests are also work sample tests and "items" that appear in the in basket test purely simulate the nature of the job in that material in an in tray appears on different pieces of paper.

5.6 The Derivation of the Work Sample

The design of any work sample test is a reduction process and as the name of the method implies the construction of the test involves the sampling of work or a type of work. Downs (1977) in her description of the design of trainability assessments has described the process as one where the 'crucial elements' of the job are extracted through job analysis and talking to competent and experienced workers. These workers are asked to describe what distinguishes good workers from poor workers at their job. A surprising result of this question is the difficulty which many people have in giving precise answers. Part of the skill in designing work samples is the degree of success the designer has in extracting this information. Failure can lead to a simulation gap which could affect the representativeness of the work sample, which in turn could reduce the predictive validity of the test. Downs (1977) has summarised this procedure for trainability tests:

"1. Analyse the job: identify the key operations and the essential skills which are required for its successful performance.

2. Select a work piece or task which incorporates these skills and operations.

3. Write a check list of errors which are liable to be made during the performance of the task.

4. Decide on the range of ratings which will be used and write a script to guide instructors on the use of the ratings.

5. Design and write the instructor's script. This tells instructors carrying out the test what to do and includes the wording which must be used when an instructor is testing an applicant.

There is an implicit assumption here that it is possible to omit crucial elements of the task from the work sample by not including a particular sort of action in the test. There is no evidence however that actually indicates the difficulty of leaving out crucial aspects of a skill from a work sample. It does seem reasonable to hypothesise that if the sample appears reasonable to people who do the job, or a similar job, that crucial elements even if they are not recognised will form a direct part of the test.

Another important consideration is the extent of the simulation of the job that is necessary in the test. Is the sampling of in tray items alone, without the physical ability to talk to people by telephone or face to face communication good enough to sample a manager's job? Here one has to resort to the practicality of introducing this sort of realism, and question whether its introduction may not defeat the purpose of making in basket tests a part of practical psychology. Annett (1971) in his analysis of the degree of simulation required to effectively train pilots questioned whether the sophisticated simulators which allowed the introduction of pitch and yaw were really necessary for pilot training. Citing the work of Buckhout, Sherman, Goldsmith and Vitali (1963) who found that pitch and yaw may only be relevant to particular subskills, Annett went on to suggest a degree of diminishing returns for trainers who tried to exactly replicate dimensions of the job, not only in the amount of effort required to secure real improvement, but also in terms of cost. Attempts at the introduction of new dimensions into in basket tests have been made, but there is no evidence that they improve the predictive validity of the tests (Gibson 1961; Lopez 1966). There appears to be no compelling reason to include these new dimensions in a test, when their only sure effect is to provide practitioners with added problems, if they decide to introduce in basket tests into their organisations.

Taking the area of work samples as a whole it would appear that these sorts of tests have been singularly successful in predicting performance. This has occurred mainly because their very structure ensures that they bear some relation to the job for which they are being used to select, which is a unique feature of work samples compared to all the other methods of selection considered in this overview of selection methods available to practitioners.

5.7 An Optimal Approach for the Practitioner

From the consideration of the methods of selection available to practitioners, there is only one that really fulfils the requirements of practical psychology, and that is the work sample.

Interviews can be dismissed because of the way they are currently abused, and the difficulty of ensuring that any change in interviewing behaviour is a permanent one.

References and Application blanks are important in their own right, but effective prediction using them would demand a technical expertise not usually possessed by the practitioner. Tests in general suffer from the problem that they are open to misinterpretation, especially the published tests which very often bear little relation to the job for which they are being used to select. The assessment centre approach is encouraging but there are too many possibilities of watering it down, consequently reducing its effectiveness, to encourage confidence in its robustness.

Work sample tests show some encouraging possibilities in relation to practical psychology. Practitioners have been encouraged to design their own tests for manual skills. Downs produced a government sponsored manual and ran courses for practitioners on how to go about constructing them (Downs, 1977).

An important advantage of the work sample is its robustness. In the author's experience practitioners can get a number of aspects of the test wrong, and even throw it together hurriedly, and it will produce better results than other techniques treated in the same way. Work Sample Tests also have built into them the necessity to at least do a crude job analysis to design the test. This process ensures that the practitioner will have to consider what the job entails. This is a considerable improvement over the comparatively invalid and unreliable selection interview or the standard intelligence test given by the unthinking practitioner.

The necessity to discriminate between good and poor performers on the Work Sample Test also forces the practitioner to consider how people are to be assessed on the job. The techniques used can be transferred to the actual job situation to aid in the performance appraisal of employees. An example is the use of the in basket test by Frederiksen and his colleagues as a dependent variable in his research on the effects of climate in organisations (Frederiksen, Beaton and Jensen, 1972). The work samples developed by Frederiksen and these researchers could be used as they are to evaluate the performance of people actually in jobs. This would be preferable to any non-anchored hastily constructed judgemental techniques, which assessors often have to use.

The Work Sample Test also has high face validity; like the interview, as a technique, it has immediate appeal. Psychologists keen to do research on the work sample test generally have little difficulty obtaining access to adequate facilities and subjects to conduct their research. This occurs mainly because practitioners find it easy to ascribe meaning to the research and see how it can be of value to them. The same is not always true of other selection methods. The introduction to the electronic assemblers trainability assessment booklet (Smith 1972) was written by the Chief Inspector of Pye Telecommunications Ltd., where the research for this test was developed. The statement illustrates the face validity and appeal of the work sample approach quite well: "It has been recognised for some time that our ability to select female operators for training leaves much to be desired. The method of selection has been by interview by the Personnel Department plus a simple test of memory. Figures showed that a large number recruited left in the first week of training. We clearly required some form of test at interview that would on the one hand show us whether the applicant was suitable for training and, on the other, give the applicant some insight into the type of work for which she would be trained. Both parties could then arrive at a decision. Advice was sought from the Industrial Training Research Unit in designing a test that would:

a. Show the applicant the type of work

b. Enable us to assess her ability to be trained

The ITRU trainabilty test does both of these things. The results of its application have contributed to:

a. Reduction in labour turnover

b. A better operator

c. Reduced training time, and therefore reduced cost."

The fact that work samples, by definition, use the jobs themselves to construct the selection tool also has implications for the recent concentration around the world on legislation to ensure that selection procedures are fair (Wallis 1980, Pearn 1976). While traditional paper and pencil tests, to choose one method, may only measure those determinants of job success that depend on age or racial differences, the Work Sample Test at least considers differences between applicants that are related to the job. This, of course, means that practitioners using such a test have more chance of obeying the law.

Work samples therefore appear very capable of fulfilling many of the requirements of practical psychology. There are few, if any, negative aspects so far ascertained in research on them. There are, however, gaps in the literature which should be filled, especially in work samples for management jobs. Filling the gaps would enable psychologists eager to promote such tests to be confident that they are psychometrically sound, as well as appealing.

5.8 Gaps in our Knowledge of Work samples

An important question is whether it is necessary to have a large number of scoring categories to predict performance on a job, or whether a global overall assessment will suffice. Meyer (1970) in his research found that the reasonably reliable individual scoring categories he used were not very successful in individually predicting performance ratings on two separate criteria he called a "supervision" factor and a "planning-administration" factor. Meyer's results are reproduced in table 5.1. The significant correlations he obtained, such as the correlation between work scheduled for a particular week and these criteria, could have been a chance result because of the number of correlations carried out in the study. The lack of replication built into the design of the research compounds the problem. It is also intuitively difficult to understand why a variable, such as work scheduled for a specific week, has a high correlation with the planning-administration criterion when a very similar scoring category like schedules work for a specific day does not. It substantiates the impression that some of the high correlations may not be replicable.

Meyer also constructed factor scores from the relationships he found between the variables he used, and factors he extracted from his data, using a centroid method of factor analysis with an oblimin rotation. The results of correlations between his extracted factor scores and his two performance criteria are also shown in table 5.1. They show significant results for two factors and the criteria used. The results appear to be encouraging for combining the raw scores through the use of a multivariate technique such as discriminant

In-Basket Category Scores	Performance Ratings "Supervision" Factor	"Pling.-Adm." Factor
Estim. no. of words	-13	17
No. subs. involved as indivs.	09	22
Shows cost consciousness	09	09
Aware of employee morale	-08	-10
Relates to other items	14	17
Prejudges etc.	00	-16
Discusses with subords.	-20	29
Asks subs. for info. etc.	13	23
Reqs. further info. for decdg.	-04	04
Arrives at proced. for decdg.	16	12
Concluding decision	01	16
Tent. or defin. plans only	10	04
Work sched. for day	10	00
Work sched. for week	-31	33
Work sched. no specfd. time	-09	-03
Leading action	13	19
Terminal action	-01	08
Follows lead by subords.	04	11
Follows pre-estd. structure	16	35
Inita. a new structure	13	22
Gives directions or sugs.	10	13
Communicates face to face	-22	23
Communicates by telephone	00	16
Communicates by writing	-01	04
Courtesy to subordinates	-01	01
Informality to subordinates	-24	18
Items omitted	-05	-19
Composite, Factor Scores		
I. Preparation for decision	25	31
II. Taking final action	01	12
III. Organizing systematically	32	40
IV. Orienting to subordinate needs	03	08
Scorer's Rating		
Overall impression of how well individual handled Plant Manager position	21	37

N = 81 - therefore correlation of 22 is significant as the five percent level and 28 is significant at the one percent level.

Table 5.1 Correlations between In-Basket Category Scores and Performance Ratings for Unit Managers in the Validation sample (from Meyer 1970) analysis. Meyer did not conduct such an analysis on his data and as he himself observes, the low number of subjects compared to the number of variables used in the factor analysis does cast some doubt about the stability of the factors and the respective factor scores he used. Finally and perhaps most importantly, Meyer found that the simple overall impression by the scorer of how well the role player handled the in basket test showed a significant relationship with both the 'supervision' factor and the 'planning-administration' factor.

The main concern of this present work is management selection, because work samples for management tasks have not been subjected to the same breadth of research as work samples for manual tasks.

Much effort still needs to be concentrated on the work sample in the context of manual skills, but at least the research in this area has firmly established the validity of the method and the work has advanced so far as the production of a manual for the design of specific work sample tasks (Downs 1977), and experimentation with audio and video as more standardised methods of presentation of the tests (Smith 1977; Norrie 1982).

The literature on management orientated work sample tests has made less progress. Gill (1979), as has already been mentioned, highlighted the paucity of validity studies and suggested that multivariate prediction using sub-scales of the in-basket test was an important gap in the literature. The research on in basket tests is also rather disjointed because individuals have tended to be idiosyncratic and not follow up the research of others. An example is the difference in the multivariate scales used by Frederiksen (1957), Lopez (1966) and Meyer (1970). More validity data is also needed on the in basket test using on the job criteria. This, together with a careful psychometric evaluation of the procedure might help to place the in basket test as a technique the practical psychologist could be confident to recommend. It was this belief which guided the direction of the present research.

CHAPTER 6

THE UNIQUE NATURE OF PERSONNEL DECISIONS

6.1 Validity and Classic Psychometric Theory

Before considering the specific hypotheses to be investigated in relation to the in basket test it is important to consider the nature of personnel decision making, because it has implications for any assessment of the psychometric value of personnel selection methods.

The calculation of the predictive validity of an instrument has become synonymous with calculating the Pearson product moment correlation between the instrument and a criterion. Defining the criterion is difficult, but Guion's (1965) definition of "that which is to be predicted" although tautological, highlights the fact that the choice of the criterion is very much in the hands of the person conducting the study. This choice of the criterion is another problem which will be considered further later.

The literature on personnel selection, as has already been revealed, rarely shows high correlations between predictors and criteria, and when significant validity coefficients of .5 or so are obtained, satisfaction is expressed about the validity of the instrument. This satisfaction is expressed because of the generally lower coefficients obtained for predictors in the majority of validity studies (c.f. Kelly and Fiske 1951).

When further considered the .5 correlation is rather poor in terms of improving predictive efficiency because the coefficients of determination in the case of a correlation of .5 between predictor and criterion is .25. Another way of putting this is to say the differential prediction of the criterion, based on knowledge available in the predictor, reduces the error variance in prediction by 25 per cent.

Assessed from the point of view of classical psychometric theory, a validity coefficient of .5 would give a rather disappointing gain of 25 per cent in predictive efficiency. Other methods of calculating predictive efficiency, such as the "Index of Forecasting Efficiency" (Anastasi 1976) which describes the reduction in the standard deviation of errors in predicting criterion scores, are even more disillusioning. A correlation of .5 using this Index indicates a low 13 per cent improvement in predictive efficiency. It is apparent therefore that from the point of view of classic psychometric theory the validity coefficients usually obtained in the selection literature provide little improvement in the precision with which exact scores can be predicted.

6.2 Validity and Personnel Decisions

Personnel decisions however, are not concerned with the exact prediction of success on a job. Essentially personnel selectors are concerned with improving their success in choosing the right people for a job and rejecting the wrong people. In practical terms the decision makers would be content, given present economic circumstances and the consequent high level of unemployment, to minimise false positives (hiring those people who turn out to be failures). Given a more favourable economy with fuller employment the ratio of those applying for jobs to the number of jobs available would be considerably lower. This would result in decision makers also being concerned with minimising false negative errors (rejecting those people who would have been a success).

This simple concern for improvement of success in selection has profound implications for the value of the somewhat low validity coefficients obtained in the selection literature. It has the effect of making even low correlations valuable for the personnel decision maker. This occurs because of the possible manipulation of cut off scores by decision makers. This is best illustrated diagramatically. Figure 6.1 shows an elipse, which encompasses a scatterplot of a validity coefficient of .5 between a hypothetical predictor and criterion. The movement of the cut off score on the predictor from A to A1 can be seen to totally remove all candidates, who as a result of previous use of the selection device, turned out to be failures. The ability of a decision maker to use the cut off point in this way is dependent on obtaining candidates who score high enough on the predictor, and this can usually only be achieved by having a large pool of candidates from whom to select in the first place.

This use of a cut off score minimises false positive errors but on the other hand maximises false negative errors. In a selection situation where there is a necessity to recruit large numbers of people from a small pool, some compromise is necessary. This

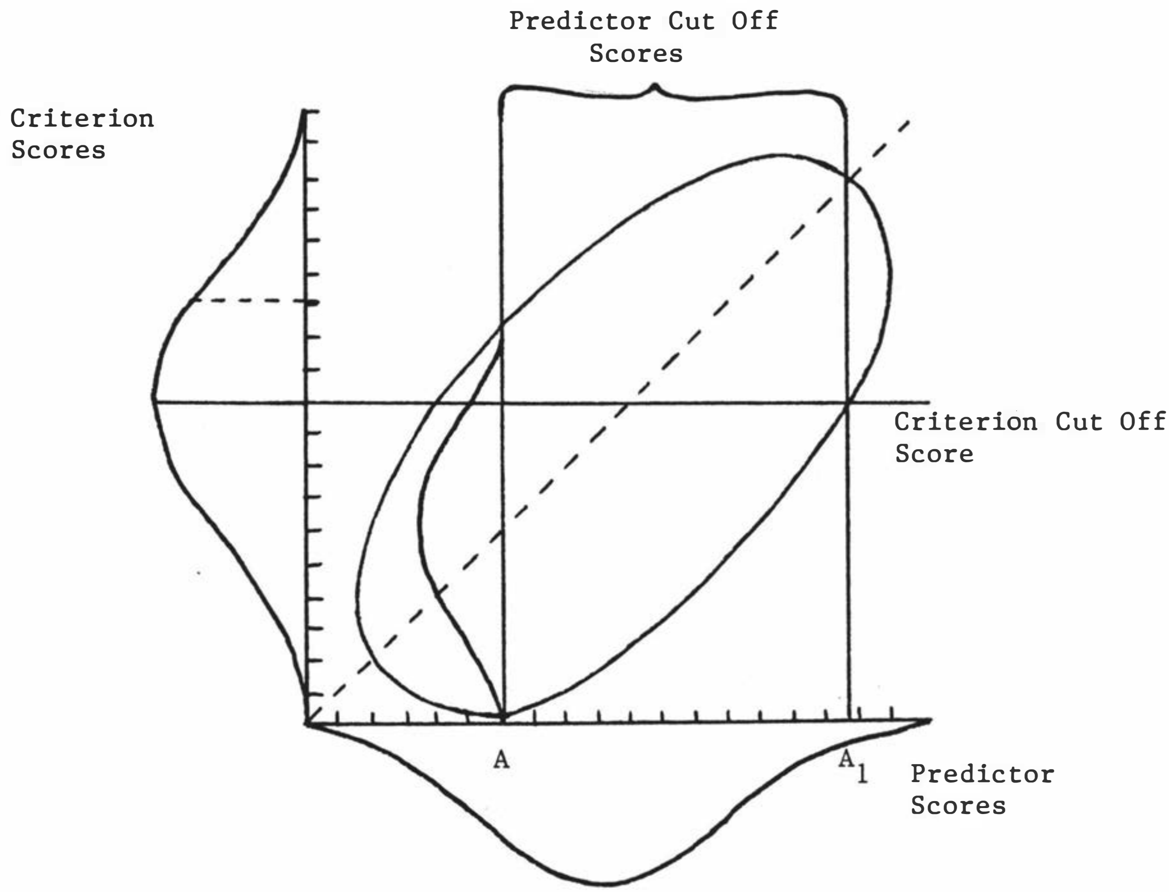


Figure 6.1 A hypothetical relationship between two variables, a predictor and a criterion, showing the effects of the movement of the cut off score on the predictor.

results in a cut off point being selected which allows a reasonable number of candidates to reach the predictor cut off score. This of course increases the chances of making false positive errors, which for some occupations, such as that of an astronaut where the cost of a false positive error is high, would be unacceptable.

6.3 Methods of Optimising Cut Off Scores

Von Neumann and Morgenstern (1947) and Wald (1950) describe methods to identify different cut off scores, according to the relative importance of false positive and false negative errors for any particular selection situation. Taylor and Russell (1939), for example, devised tables which show the percentage of newly selected individuals who will be successful, through the use of the pre-selection success rate, the selection ratio, and the validity of the predictor. The tables show what happens to the proportion of true positives to total positives as the predictor cut off and criterion cut off scores are moved up and down.

A belief that the Taylor and Russell tables do not allow for degrees of success and failure, and the necessity to identify a simple criterion score separating success from failure, led to the development of the Naylor Shine tables (Naylor and Shine,1965). The extent to which the inabilty of Taylor and Russell tables to allow for degrees of success and failure is a limitation may be exaggerated for personnel selection situations where, as has already been stated, often this is all that the practitioner in industry is interested in doing.

The Naylor Shine tables allow the calculation of the payoff of a selection device through describing the difference in average criterion score for those selected compared to the original group. Job proficiency in this case is a continuous variable and the gain from selection is calculated by subtracting the criterion means of the two samples, thus avoiding the necessity of specifying the criterion score separating the successful from the unsuccessful.

In practical terms the value of this is questionable, because in practice there is always a cut off score between the successful and the unsuccessful: not specifying it simply avoids the issue.

Another technique for describing the payoff from selection in terms of percentage increase in job proficiency was described by Ghiselli and Brown (1955). They constructed a nomograph which showed the relationship between validity, the selection ratio, variability in job proficiency (ratio of the best to the poorest worker) and per cent improvement in proficiency.

The nomograph is reproduced as figure 6.2 and though it appears to have utility many practitioners would find it difficult to read and understand it. There is also some doubt about the ability of anybody to reliably provide a ratio of how much better their best worker is than their worst. In some ways the technique could be accused of bringing psuedo-objectivity to dimensions that are very subjective.

The common feature of all these methods is that they demonstrate that the utility of a selection method for personnel decision makers

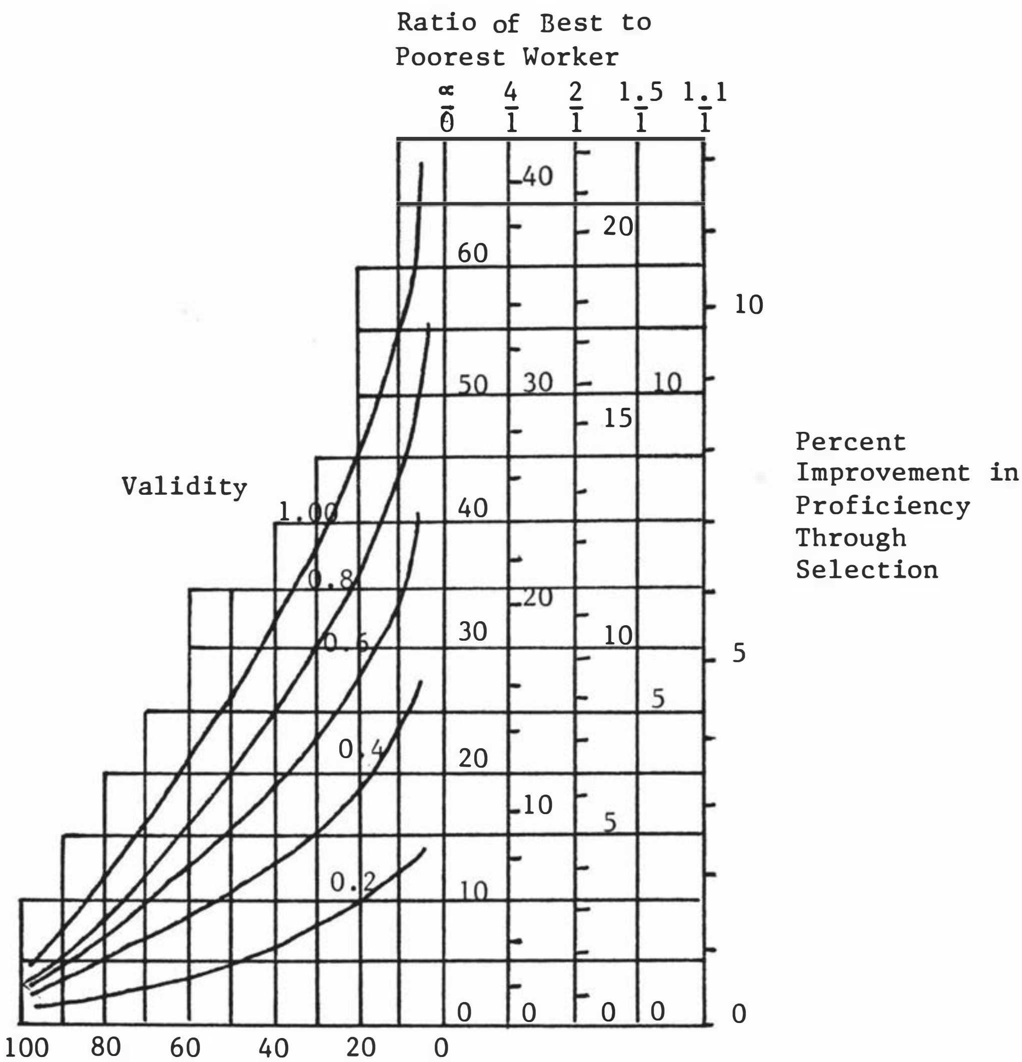


Figure 6.2 The relationship between validity, the selection ratio, variability in job proficiency (ratio of the best to the poorest worker), and percent improvement in proficiency. (after Ghiselli and Brown 1955).

is not dependent on the validity coefficient alone. Low validity coefficients can be compensated for by large differences between good and poor workers, and a large pool of people from whom to select. The former is very much job dependent and a subjective assessment for the practitioner. The latter, with the large number of unemployed appears to be a consistent feature of any position that is advertised at present.

It would seem therefore that given the right circumstances validity coefficients as low as .2 can be useful in personnel selection, where they might be regarded as of little use for precise criterion prediction.

6.4 The Criterion Problem

The earlier consideration of the value of common selection methods for personnel selection neglected to report the importance of a reliable and valid criterion for the evaluation of the methods.

To illustrate the relationship between predictors and criteria Blum and Naylor (1968) used a Venn diagram which is reproduced as figure 6.3. The model introduces the additional concept of the ultimate criterion which is defined as "a theoretical and ideal criterion that usually exists only in the psychologist's mind. It is the "true" criterion of success while our actual criterion is the measure we have been forced to adopt simply because we can do no better".

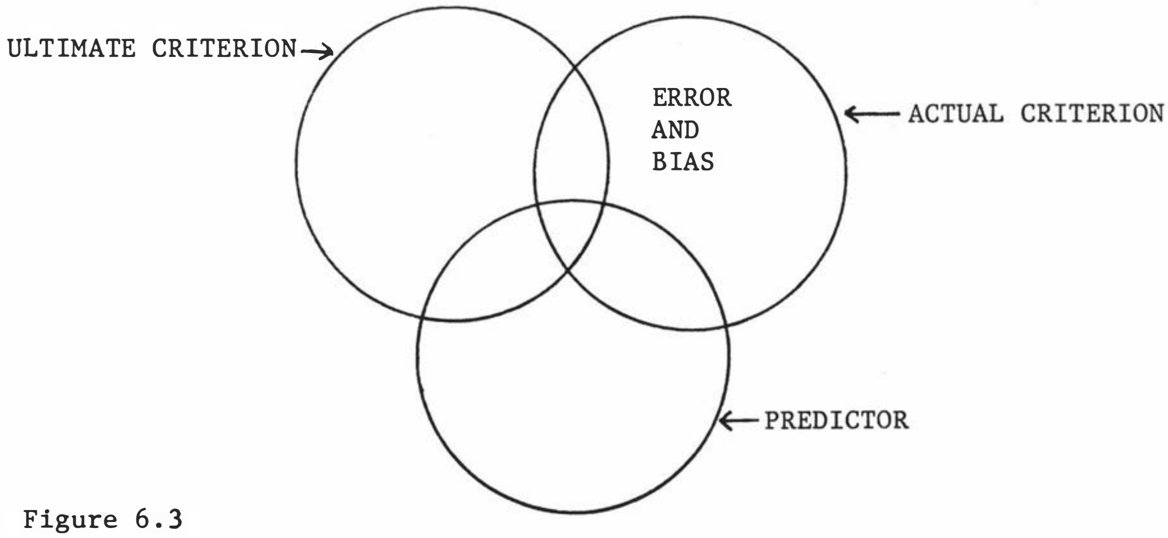


Figure 6.3

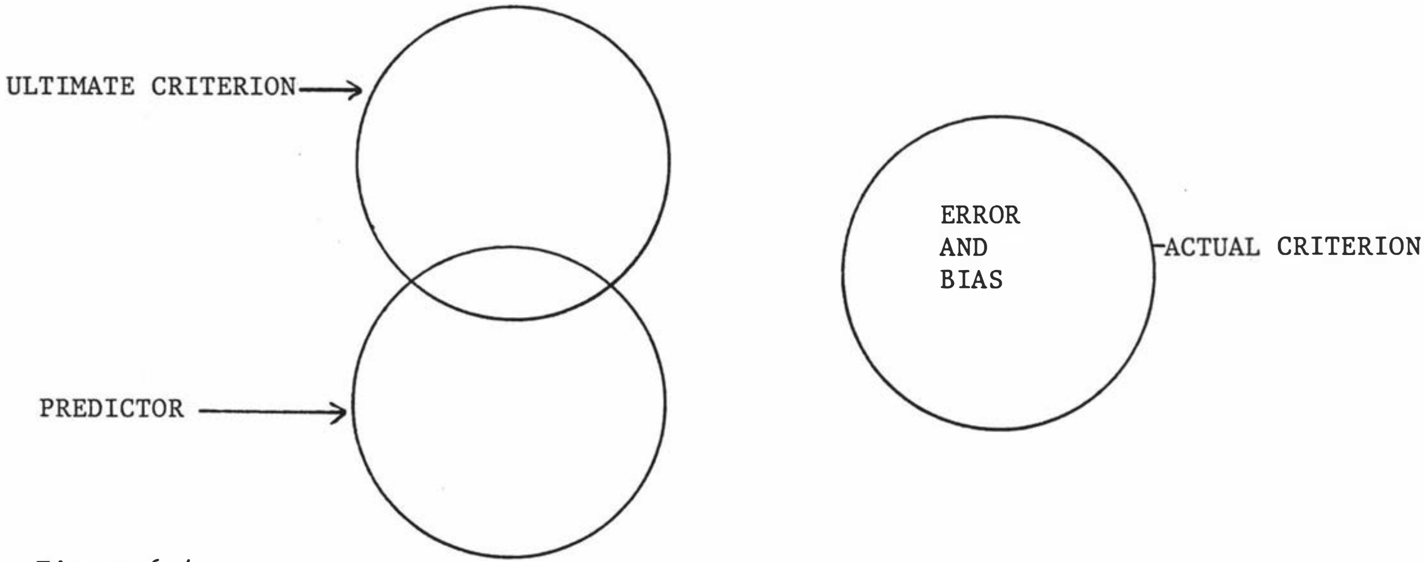


Figure 6.4

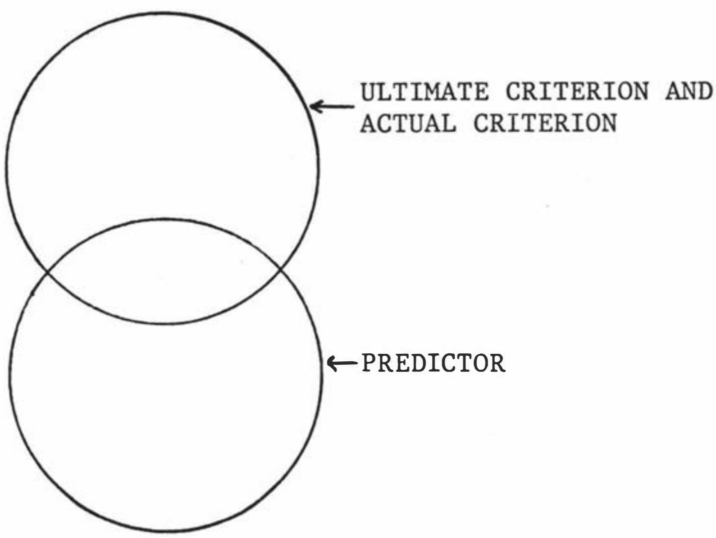


Figure 6.5

Potential relationships between the ultimate and actual criterion and a predictor (Adapted from Blum and Naylor 1968).

The model is helpful because it shows in a typical validity study how poorly the actual criterion used might represent the criterion that is intended. It highlights the error and bias that can occur in the measurement of the actual criterion, and shows that in the evaluation of any derived validity coefficient between a predictor and a criterion, cognisance must be taken of the reliability and validity of the criterion used in the study.

The position of the circles in Blum and Naylor's model are of course not fixed and can vary according to how the relationship between the three constructs is viewed. Figure 6.4 shows a very much more pessimistic view, where the actual criterion bears no relationship at all to the ultimate criterion nor to the predictor. If this was translated into validity coefficients the relationship between the predictor and the criterion would be zero, yet the predictor would in fact be accounting for some variance in an ultimate criterion, which is not being measured.

Figure 6.5 shows a much more optimistic view of this relationship, with the actual criterion perfectly measuring the ultimate criterion. In practice the actual criterion would usually fall in between these two extremes. However, this can never really be assessed and it is the task of the psychologist in any research undertaken to reduce the effect of error and bias in the actual criterion as much as possible.

Any comparison of techniques in a critical review considers trends in validity coefficients over a large number of studies rather than a commitment to one or two pieces of research, which might support the preconceptions of the individual psychologist. This use of a number of studies also provides a safeguard against the difficulty of controlling the reliability and validity of the criterion. If a number of studies are used, and a consistently significant level of validity is found, it emphasises the robust nature of the technique, and some confidence can be felt in the utility of the selection method. The criteria obtained for the evaluation of selection methods are often unreliable and invalid, but there is no reason to suppose that criteria obtained are any different from method to method. The work sample test however, could force practitioners to consider the job for which people are being selected a little more, with consequent benefits for the criteria that are used to evaluate the method. There is however, at present, no evidence to support this hypothesis.

Since there is no real way of establishing the validity and reliability of most criteria it is surprising that most validity research in an industrial setting has continued to regard the criterion as a continuous variable, when in many situations a practitioner's main concern, for any single individual, is the probability of that individual being classed as successful on the job. The practitioner's aim is to discriminate at selection between the potentially successful and potentially unsuccessful. This black or white decision is much simpler to accomplish in terms of criterion construction, and less prone to error, since assessors of individuals at work are not being asked to consider degrees of success or failure. If the latter is attempted there are techniques such as Behavioural Anchoring (Smith and Kendall 1963), Pair Comparisons (Guilford 1954, Edwards 1957), Mixed Standard Rating

Scales (Blanz and Ghiselli 1972) and the Forced Choice Method (Guilford 1954, Zavala 1965), available to reduce the common errors of halo, central tendency and positive and negative leniency. These techniques improve the reliability and validity of judgemental methods, but their use demands technical knowledge which very often the practitioner neither possesses, nor has access to through other sources. Most continuous judgemental criteria used by practitioners are often based on simple graphic rating scales, with all their problems of error and bias.

6.5 Non Judgemental Criteria

Non judgemental criteria such as production data and records of absenteeism and punctuality are prone to other sorts of problems. Objective production data have three main problems, their reliability, the changing nature of work, and the difficulty of obtaining objective data for supervisory and managerial jobs.

In a study of the reliability of production data Rothe and Nye (1959) designed an experiment to assess the stability of output rates for machine operators. They found that the way workers were paid affected the stability of production data. Greater stability was found for the measures of amount of production when people were paid on an incentive system, than when they were paid on a rate for a day's work.

The reliability of production data is further complicated by the inequality of time periods when observations of productivity are taken. If observations of output are taken over a one week period, a number of unusual events, such as power cuts, or a lack of raw materials, could affect output for that period. A reliable measurement demands a period of time long enough to remove the influence of such events. This may not be possible in large scale validity studies, and so the experimenter has to resort to a judgemental method.

The changing nature of work also causes problems for the collection of production data. Less and less workers are now directly involved with making units of production; they are now more involved with minding the machines that have directly taken their place. A good example is the use of 'robots' in car manufacturing by the Fiat motor company and other international car manufacturers. This change is causing the objective measurement of the output of manual workers to be as difficult as that of objectively measuring the output of managers. It cannot usually be done in any meaningful way, so judgemental methods are substituted.

The data available from personnel departments in the form of turnover and absentee records are of limited value as criteria. They may be of some importance, if they are available for manual jobs, but their use would be misleading and somewhat irrelevant for managerial occupations. Latham and Russell (1977) in a study of attendance records also showed that they had low reliability thus suggesting that if any data of this type is used careful checks should be made on how it is collected. Generally if personnel data is used researchers have to set up the collecting procedures for themselves, this at least ensures that there is some check on the care with which the records are collected.

It does seem that researchers are reluctant to set up, or find difficulty in setting up such procedures, for a study by Guion (1965) reported that 81 per cent of the validation studies in the Journal of Applied Psychology between 1950 and 1955 used a form of judgemental assessment as the criterion.

6.6 Practical Psychology and The Criterion

A careful study of the criterion problem suggests that obtaining reliable and valid criteria is difficult. The simple division of any assessment into those who have been successful and those who have not, must help reduce many errors in the assessment of people in work. As Downs (1970) has communicated in her consideration of the construction of work samples for trainability assessments, skilled workers do not find it difficult to separate good workers from poor workers. She uses this observation as a means of helping to distinguish the crucial elements in a skill so that a work sample can be chosen that contains these elements. If this is the case it seems reasonable to use a simple division into successful and unsuccessful as a basis for the criterion in the first place, and get assessors to allocate the people being assessed to these groups.

This change of method also has implications for any multivariate study of the validity of any predictor. Gill (1979), for example, in suggesting the desirability of multivariate research on the in basket test suggests the use of multiple regression. The use of this technique allows for a continuous dependent variable, or in the case of a validity study, a continuous criterion. The argument has already been made that categorical data should be used in the criterion and this suggests that multiple discriminant analysis is therefore a more suitable technique.

Discriminant analysis attacks the problem of classifying individuals into groups based on their scores on a test or tests. The prediction is done on the basis of a least squares composite of the number of test scores, from which a prediction of success or lack of success on a particular criterion is made. It is interesting that Kerlinger and Pedhazer (1973) in their discussion of discriminant analysis note that "Although discriminant analysis seems not to have been used very much in behavioural and educational research, it has interesting potentialities." There is also a remarkable coincidence in the early example they suggest for its possible use:

"Take a rather unusual but potentially fruitful example. Suppose we have three measures of administrative performance acquired through the In Basket Test (Hemphill,Griffiths, and Frederiksen, 1962): Ability to Work with Others, x1, Motivation for Administrative Work, x2, and General Professional Skill, x3. In addition we have ratings of the same administrators on their administrative performance, as observed on the job or in simulated administrative situations. These ratings are simply "successful" and "unsuccessful". How can we assign the individuals - and other individuals not in the sample - to the successful and unsuccessful groups?" Their answer is by using discriminant analysis and it is the use of the above rationale and the early argument of this chapter that determined the use of this statistical treatment for the validity studies of the in basket test in this research.

CHAPTER 7

AIMS HYPOTHESES AND METHOD

7.1 Aims and Hypotheses

The main aim of the present study is to demonstrate the value of the in basket test as a part of practical psychology. To be regarded as practical psychology, in basket tests should have inter scorer reliability, be easily administered, designed and scored in the real life setting and should be valid. To provide a focus for this aim, four hypotheses were constructed and tested in the research.

They were:

1. A single variable of overall assessment of performance on the in basket test would be at least as good as a multivariate method of scoring the test over a number of samples.

2. The single variable of overall assessment of performance on the in basket test is a valid method of marking in basket tests over a number of samples.

3. The overall assessment of performance on the in basket test is a reliable measure of in basket performance.

4. The in basket test can be designed and administered by a practitioner and be shown to have limited concurrent validity.

Some explanation of the hypotheses and how they relate to practical psychology is necessary. The first hypothesis deals with the single variable approach as opposed to the multivariate approach to scoring the in basket test. It is likely that any multivariate scoring procedure would be complex and although it could be valid it would be extremely difficult for practitioners to use because of the necessity to combine the individual scores in a statistical way, usually through multiple regression or discriminant analysis. The multivariate method of scoring the in basket test is therefore not practical psychology. A comparison between the two methods was conducted because a secondary aim of the research was to establish if the multivariate approach was useful for predictive purposes in an applied psychology sense. This general aim was an attempt to fill the gap suggested by Gill (1979) that up to the present a multivariate approach to prediction using the in basket test had not been attempted.

The first hypothesis was tested using two different sorts of criteria. One was a measure of general success on an examination which is described later and the other was a specific measure of behaviour: how well the people who did the in basket tests kept to a strict timetable for completing work.

A study in the practical setting served the dual purpose of further testing the validity of the single measure of overall assessment of performance on the in basket test and testing hypothesis four.

The research conducted to test the hypotheses can be divided into four parts. A reliability study, factor analyses, discriminant analyses and the freezing works study. The reliability study was conducted to establish the reliability of the single measure of overall assessment on the in basket test (hypothesis 3) and to establish the reliability of the other scoring categories used in the research. It was on the basis of attaining reasonable reliability coefficients (in this study, .7) that scoring categories were allowed to be used in the study of the multivariate approach to prediction using the in basket test. The factor analyses were conducted in an attempt to further reduce the number of variables for the multivariate study and to fulfil a subsidiary aim of exploration to discover if more general and simpler methods of multivariate scoring could be established by comparing the results of the present study with previous factor analyses of in basket tests. The discriminant analyses were conducted to test hypotheses one and two. The study in the practical setting (the Freezing Works Study) was conducted to test hypothesis four. The subjects and test used in the first three parts of the research were the same and these parts constituted what could be called a psychometric evaluation of in basket tests but with a focus of testing the hypotheses described earlier. For this section an attempt was made to fulfil the usual demands of such studies and the particular problems associated with them, which are described below.

7.2 Problems Associated with a Psychometric Evaluation of In Basket Tests

To test the first three hypotheses large numbers of subjects are required to reduce the possibility of chance results as far as possible. When evaluating selection methods such as more conventional paper and pencil tests, problems of subject acquisition occur, but the problems are greater in psychometric studies of the in basket test because it is necessary to test people for whom an assessment in a managerial skill is available.

To carry out the research on the psychometric aspects of in basket tests a compromise has to be made between designing the in basket for a specific job and evaluating it rigorously with an adequate sample. That is why for this research a general form of an in basket was designed which was not related to a specific job. It was constructed so that it could be completed by a large group of available subjects, about which some independent criterion scores were available which had some relevance to the job of a manager. A separate piece of research was required to test the robustness of the in basket test in a real life situation. This later research would have to compromise many of the requirements of a good psychometric study but would have the advantage of being a work sample (in basket) test designed to predict performance for a real job.

The fourth part of the study is discussed separately (in Chapter 12) because of the rather different nature of the research. The rest of this chapter deals with the subjects used in the first three parts of the research and the circumstances in which they took the specially designed Plasto in basket test. The design and scoring procedure of the test itself is detailed in the next chapter.

7.3 The Subjects Used in the Psychometric Evaluation Study

The biggest source of subjects for psychologists are students. This is hardly surprising since psychologists are so often involved in teaching them, and can make the completion of particular tasks a necessary requirement for the completion of a course. The circumstances of the present study were no different. The bulk of subjects used in the first study were students, but the addition of a separate group of scientists working at the Department of Scientific and Industrial Research, together with special circumstances surrounding the nature of the students used, made the sample somewhat more heterogeneous and consequently more comparable to a sample of managers from industry.

Table 7.1 gives details of the sample available for the factor analytic and discriminant analysis studies which formed the core of the first part of the research. The first fifty in baskets, which were from the 1977 extramural student group were also used for the assessment of the reliability of scores.

Three large groups of students were used in the research. These were groups one, two and three, which were respectively 1977 extramural students, 1978 internal students, and 1978 extramural students. The internal students were like any other student group and suffered the usual problems groups of this kind have, compared to a general population sample, for conducting research. They were young and, perhaps more importantly which is related to their youthfulness, they lacked experience of work. This occurred because they followed the usual pattern of coming to University straight

Group		Sample Size
1977 Extramural Students		192
1978 Internal Students		66
1978 Extramural Students		114
DSIR Scientists Group A		21
DSIR Scientists Group B		14
DSIR Scientists Group C		24
	Total	431

Table 7.1 Names and sample sizes of the groups used in the research

	Female	Male
Below 35	152	98
Above 35	76	27

Missing data = 78 subjects unclassified

Table 7.2 A cross-tabulation of the age and sex of the total sample from school.

The extramural students were very different subjects. 'Extramural' is the name given to students at Massey University who are doing courses by correspondence. In this respect, they are little different from students completing degrees at the Open University in Britain or the various correspondence Universities in Australia such as Armadale. They differ from internal full time students in two important respects. Firstly, they are usually fully occupied with some other daytime activity that prevents them from attending University during regular hours. This activity can range from looking after a home and family to being a fisherman - nothing is excluded. Secondly, they are usually older and thus provide a greater spread of ages in a sample. For experimental purposes this makes them more comparable to the target group of managers. The greater spread of age in the extramural student groups also means that these groups are more aware of the world of work because of the experience they possess. The age differences are clearly shown in Tables 7.2, 7.3, 7.4, and 7.5, which are a crosstabulation of the various groups used, showing their ages and sexes.

Three groups of D.S.I.R. scientists were also used in the research. These subjects were obtained at a science management course which they were obliged to attend. The scientists were regarded as some of the most promising in their respective fields, and were regarded as the strongest candidates for future promotion into administrative roles, should they choose to apply.

	Female	Male
Below 35	89	37
Above 35	37	17

Missing data = 12 subjects unclassified

Table 7.3 A cross-tabulation of the age and sex of the 1977 Extramural student sample

	Female	Male
Below 35	16	40
Above 35	3	3

Missing data = 4 subjects unclassified

Table 7.4 A cross-tabulation of the age and sex of the 1978 Internal student sample

The addition of this group to the sample helped make the exploration by factor analysis of the scoring categories, which was one of the analyses conducted in the research, even more generalisable to managerial groups. For the purposes of identification, the sample of scientists were separated in the computer analysis on the basis

	Female	Male
Below 35	47	21
Above 35	36	7

Missing data = 3 subjects unclassified

Table 7.5 A crosstabulation of the age and sex of the 1978 Extramural student sample

of the science management course they attended where the tests were completed. No difference was anticipated between these separate groups of scientists. No cross tabulation of age and sex was available for the D.S.I.R. scientists because age data was unavailable. Some student subjects were also not classified in the tables because data concerning their ages was not made available.

7.4 The Administration of the Plasto In Basket in the Psychometric Study

There is some argument in the formal literature on testing about the merits of testing for speed or power. Anastasi (1976) describes a speed test as one in which individual differences depend entirely on speed of performance. All the items are of uniformly low difficulty and they are well within the ability level of the persons for whom the test is designed. Time allowed for the test is made so short it is impossible to complete all the items, so speed of work is reflected heavily in a person's final score. A pure power test on the other hand has a time limit long enough to allow everyone to attempt all items. The difficulty of the items is steeply graded, and some of the items are too difficult for anyone to solve, so that no one can get a perfect score.

The difference between items in a conventional paper and pencil test and an in basket test will be discussed in full later. Suffice it to say that there are no items in the conventional sense in an in basket test, so to talk about items being more difficult than other items does not really make much sense in the context of work samples in general, and the in basket test in particular. The general approach adopted in the procedure is that of a power test, in that role players were expected and encouraged to complete the test. Any parts not attempted were a function of the role players' deliberate choice. Consequently the lack of response to any part of the test could be regarded as a scorable behaviour on the test.

To allow role players as much time as possible to complete the test they were allowed in the case of the internal University students to take the exercise home and were given a week to complete it. Extramural students (correspondence students) were sent the test by post, and were asked to complete it within a set time period, usually no longer than six weeks. This difference in time allowed to sit the test was not considered an important difference between the groups, because it was found when the test was designed that most people could complete it within two hours. The D.S.I.R. scientists were given the test on their management courses and were allowed enough time to complete the test to their individual satisfaction.

In a real life selection situation the lack of supervision could be a problem, because of the temptations to role players of asking for the help and advice of others, which would affect the results. In the first study of this research it was not regarded as a problem, because the primary aim was to obtain more detailed psychometric knowledge about in basket tests. In order to achieve this a large population of scores on such tests was necessary. The non supervision aided the collection of data, but would not be contemplated for any practical selection situation. As is reported later, the sample for the real life study was supervised when the test was taken. For the non-supervised group there was little motivation to get help to complete the test, because performance on the test was not a contribution to a final mark on any course.

7.5 The Dependent Variables or Criteria used in the Psychometric Study

One of the hypotheses in the study tests the psychometric value of the in basket test for predicting performance. In a study of this kind it is necessary to have relevant criteria that can be seen as meaningful and that are not too disparate from the criteria that are used by people in practical settings to assess the performance of people at work.

The subjects of this experiment were mostly students. A natural criterion to adopt therefore would be their academic success or failure on the course they were taking. The use of such a variable, while not fulfilling all the requirements of a variable to be based on a criterion of success in a managerial job, does bear a considerable number of similarities to a management skill, as can be seen from a consideration of some of the literature.

Much effort has been concentrated on predicting academic success at universities. Entwistle (1974) discussed two reports (Choppin Orr Kurle Fara and James 1973, and Powell 1973) on the results of such research. Papers have been published discussing variously the relationship between personality and academic attainment (Elliott 1972, Entwistle and Brennan 1971), the relationship between scales of motivation and study and academic attainment (Entwistle Nisbet Enwistle and Cowell 1971) and intelligence tests and academic attainment (Pilkington and Harris 1967). A limited success has been obtained using tests for the prediction of academic performance, but previous academic performance remains the best single predictor.

There is little doubt that intelligence is not the sole determiner of performance at Universities. Personal discipline, motivation and organisational ability also play a part. This is supported by the ability of scales of study habits to account for some of the variance in dependent variables, like success or failure in University courses (Entwistle et al 1971). Work by Smith (1977) on the selection of dental students further emphasises the diverse nature of academic success. He showed the importance of the relationship between the method of testing and the type of evaluation method used in an academic setting. The evaluation procedure for dental students includes a consideration of their practical performance. He showed that a work sample (a trainability assessment) based on a skills analysis of the tasks required of students was the best predictor of these skills.

Academic success therefore is not determined by intelligence alone, and though people in managerial jobs might vehemently deny any relationship between good managerial skills and success at University, the way organisations have pursued the most successful University graduates, even during periods of recession, suggests that there is some contradiction between what they might say, and how they act.

The use of a criterion like success at a University course as a substitute for a measure of managerial performance is a compromise, so that larger numbers than have been customarily used for validity studies on the in basket test can be used. Nevertheless the results of this part of the research should give more substantial evidence of the value of the procedure. This in turn could lead to some further justification for its use in practical settings as sound practical psychology.

7.6 The Criteria Used for the Research

Final assessment marks on a course in Industrial and Organisational Psychology were used as the first criterion in the psychometric study. Final assessment was based on performance on five assignments carried out by students during the year, some of which involved the use of specific techniques and skills for more efficient managerial decision making. One of these involved the interpretation of a correlation matrix and the manipulation of a selection ratio and validity coefficient for optimal selection decisions as described earlier. This portion of the course contributed 50 per cent of the subject's final assessment, performance on a final examination making up the remainder. For the purpose of the discriminant analyses used in this study subjects were divided into those who passed and those who failed this assessment process. A combined total of 50 per cent was used as the dividing line between those who passed the course and those who failed.

7.7 The Criterion Compromise

Criteria used in the evaluation of in basket tests have typically been of a very general nature. Meyer (1970) for example used a factored supervision scale for one criterion and a factored planning administration scale for another. Lopez (1966) used general ratings of performance when validating a secretarial in basket test and Wollowick and McNamara (1969) used the increase in level of managerial responsibility over a set period of time as their measurement of managerial success. On the other hand scoring procedures in in basket tests employ very specific categories of behaviour to evaluate performance. If an argument is made which suggests that an overall assessment of performance on an in basket test cannot be significantly improved upon by the detailed consideration of the responses of the role player; criteria must be used that the scoring categories of the in basket test can be expected to predict. It seems ridiculous for example, to expect a scoring category such as 'discusses problem with subordinates' to predict a general rating of overall performance on a job. If, on the other hand, some indication was available of the degree to which a person did discuss problems with subordinates on the job and it was considered an important determinant of job success, it might be a fairer prediction to make using that variable.

As has already been discussed, obtaining reliable and valid criteria is a difficult and exacting process. To obtain an indication of the degree to which a person discussed issues with subordinates could be difficult, because ultimately a reliance would have to be placed on some sort of judgemental scale. These would be difficult to construct in a reliable and valid way for a behaviour such as 'discusses with subordinates' because of the difficulty of establishing each and every time the behaviour occurred. To even begin to obtain a truly valid measure, an observer would have to follow a manager around all day - not a very practical possibility.

This problem does not apply to all the scoring categories used to score the in basket test however, and it was possible in this study to obtain a non judgemental criterion which some of the scoring categories could be expected to predict.

7.8 The Design of 'Ontime'

Students who completed the in basket test, as has already been stated, were all obliged to complete five assignments as part of their overall assessment procedure. These assignments all had to be completed by different dates evenly placed through the year. Students were encouraged to hand in their work on time by stating that they might fail the course if they did not do so. Inevitably a number of students did not meet the deadlines set, but were allowed to continue in the course and in many cases sit and pass the final examination. The date assignments were posted by extramural (correspondence) students was recorded, and the availability of this data allowed the use of a criterion of a non judgemental type concerning how the role players dealt with these deadlines.

This variable could have been collected and used in a number of ways. The first problem was to determine the method by which the dates available could be quantified. This was done by calling the date a particular assignment had to be handed in zero, and counting forward or backwards to the actual date each student handed in the work. Negative scores were given to late assignments, and positive scores to assignments handed in before the correct date.

An obvious way of determining a score on this variable, which for simplicity is called 'ontime' would be to add up the scores assigned to each assignment and use the grand total as an individual student's final score on the variable. This has the disadvantage of reducing the importance of lateness for any one assignment. Being a day late for one assignment for example could be compensated for by being excessively early for another assignment. It seems more appropriate to consider being late on even one assignment as critical, and as a result, placing a person in a group which failed to meet set deadlines. Two groups were therefore extracted from this data; students who managed to hand in all their assignments on time, and those who handed in one or more assignments a day or more late. One of the discriminant analysis studies described in a later chapter concerned the ability of relevant scoring categories to discriminate between these two groups.

The in basket test itself was constructed especially for the psychometric study, and it is now appropriate that its design, and construction be considered before moving on to the reliability study, the factor analyses, and the discriminant analyses, which test the first three hypotheses set out in the first section of this chapter.

CHAPTER 8

THE DESIGN AND SCORING OF THE IN BASKET TEST

8.1 Two General Forms of Work Sample Design

The design of work samples can take two general forms: one which closely follows the job analysis of a specific job and another which attempts to capture, through agreement, some general elements of a group of occupations. The former approach has been used most often in the design of tests for manual jobs where the point to point correspondence between job and test are more important because of the independent nature of manual skills (Fleishman, 1962). In administrative jobs, on the other hand, Lopez (1966) suggests that over half of a typical manager's job is common with that of other managers, thus making it perhaps necessary for a particular in basket test to be used for more than one job. Rather than a direct point to point relationship between a test and the job, the test designer concentrates on what Stewart and Stewart (1976) call the "perceived" relevance of the test by the candidate and practitioner, but not at the total cost of actual representativeness to any individual managerial job.

The purpose of the major part of this study is to gain further psychometric information about the in basket procedure.

The approach adopted in this research for the design of the in basket test was 'perceived' relevance by practitioners and takers of the tests. The use of a test already available was discarded, because it was felt that an important element of relevance was that the company around which the test was built was seen to be based in New Zealand. Only the design of a new test could give the exercise some problems that were distinctively local in origin.

8.2 The Setting of the Plasto In Basket Test

During the in basket test each subject assumed the name and position of A.P. Allen, personnel manager of Plasto (N.Z.) Ltd. Each subject was given a fact sheet (see Appendix 1) which included details of the background of the company, its philosophy, some details of relations with the union, a calendar, and a description of A.P. Allen and thumbnail sketches of all the people in the section.

An attempt was made to keep information in the fact sheet as neutral as possible so that it would not slant responses to the test in any particular way. Thus the description of the union is intended to depict the union as being responsible, which should lead to a degree of respect from Allen and the organisation as a whole.

The goals of the organisation are kept positive with a desire for good public relations, which is not unusual for any organisation. Hence the company's slogan "Plasto: the socially responsible company", which all members of the organisation interpret differently.

An attempt is deliberately made to make Allen's situation ambiguous:

a good example is the paragraph on centralisation and decentralisation. It is expected that, as a result of this paragraph, people who play the role of Allen would take varying degrees of responsibility, sometimes with beneficial effects in terms of performance, and at other times negative effects.

In basket tests have to be ambiguous in nature for two reasons. In the first place if courses of action are unambiguous then there is a great likelihood that responses from candidate to candidate would be very similar, with the consequence that differentiating between their performance becomes a difficult if not impossible task. Secondly as Mintzberg (1973) eloquently observes, "It is not the decision making under certainty, risk or even uncertainty of the text book that the manager faces but decision making under ambiguity." In other words, the in basket test must be realistic, and decisions by managers in real life are often made where circumstances are ambiguous. This means that the test must contain ambiguity, because the way different people cope with it could be an important means of differentiating between people who are good managers and poor managers.

8.3 The Personnel Manager's Job Description

A copy of the job description provided for the Plasto in basket test is shown in Appendix 2.

The job description is not a full job analysis and in this respect theoretically follows the relationship among job analysis, job evaluation, job description, criterion development and performance appraisal presented by Landy and Trumbo (1980) and represented in figure 8.1 which shows a graphic description of the functional relationship of job analysis to criterion development.

Job analysis in this model is conceived as a search for the primary units of performance. Landy and Trumbo use the example of a videotape system with stop-action and slow motion capabilities used to break down a golf swing into a large number of individual frames so that corrections to the swing can be made. Any job would include a number of breakdowns of this type with the combination of them all being a job analysis.

The job analysis therefore would be a very lengthy document and probably unwieldy for such purposes as conveying the essentials of a job to a new applicant or to a manager who wants to get a rapid appreciation of what is entailed in a large number of jobs. The job description is therefore written for these sorts of purposes. In the in basket test, it is intended that the role players gain a general appreciation of who they are responsible to, and what are their general duties in the organisation. It is written in such a way so as not to influence the way the role player deals with any of the items in the test. Its set is intended to be neutral, but it may not affect individual role players in the same way. This was verified by colleagues, and managers in industry, who perused and informally tried out the test.

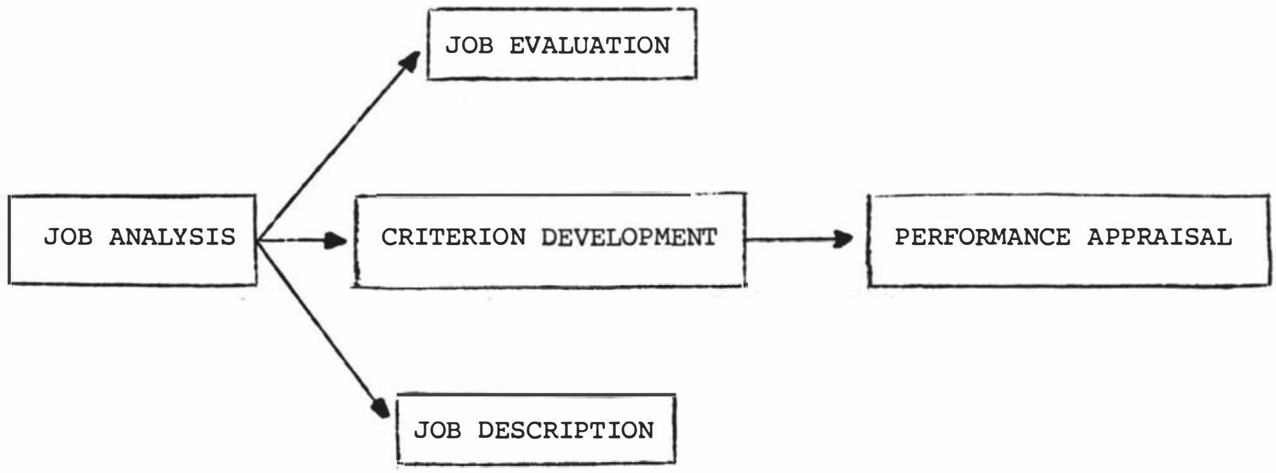


Figure 8.1 Relationships among Job Analysis, Job Evaluation, Job Description, Criterion Development and Performance Appraisal (Landy & Trumbo 1980)

8.4 The Organisational Chart of Plasto

When designing a test which is related to a specific organisation the design of the organisational chart is straightforward, because the chart would simply reflect the organisation for whom the in basket test was being designed. In the present situation where the test is designed without recourse to a specific organisation, the design of the organisational chart is much more difficult.

This is because the span of control of the organisation, or the number of subordinates a manager is responsible for supervising, could be any size. In practice, span of control for any one job is determined by the limitations of the individual to process information, and the nature of the work. Miller in his classic study (1956) "The magical number seven plus or minus two" suggested that any individual was limited to coping with around seven events at any one time. It is of course possible that there are individual differences in the efficiency with which people order priorities, but ultimately any task can be made impossible for anyone.

Woodward (1958) in her study of the span of control in first line supervision in British Industry showed how the nature of work affected this variable. She found that there were considerable differences between the span of control of small batch organisations (those that made cars and other similar goods on assembly lines) and continuous process organisations (those that operate on a continuous process for their product, like most chemical operations). Small batch organisations had a median span of control of 21 to 30; large batch organisations had a span of control of 41 to 50; and continuous process organisations had a span of control of 11 to 20.

The reasons for the differences can be explained by the cost of errors in the respective industries. The cost is especially high in process operations where an error could shut down a plant for days and result in the loss of millions of dollars, thus the responsibilities for inspection and quality control tend to be done by managers rather than workers. This makes much more work for managers in process organisations, because the amount of routine management tasks in these organisations are no less than any other.

It is not surprising therefore that organisational charts as such are evolutionary in nature, and tend to change as the managers within an organisation change. If the organisation diversifies into new products the formal organisational structure can be affected by the nature of the products made.

In the in basket test the task of designing the organisational chart was simplified by making the role to be played by candidates that of personnel manager. The position had no direct line responsibility, which is often the case in the real life situation.

Previous discussion has highlighted the nature of the simulation gap between the work sample and the task it attempts to simulate. It is possible that reading the organisational chart does not provide role players with much appreciation of their span of control, except in a crude sense of knowing to whom they are responsible and who is responsible to them. Given this situation it is only through the items that candidates can get an appreciation of the breadth of their role, for as in all jobs there can be great differences between the way the organisational chart formally ascribes span of control and the degree of span of control for the person actually carrying out the job. The organisational chart designed for the Plasto in basket test is shown in Appendix 3.

8.5 The Design of the In Basket Items

In designing an in basket test based on a real job the items that make up the test can be obtained by carefully selecting from material that makes up the job. As stated previously the skill comes in selecting the appropriate items for the test, because the task is one of a reduction process.

For the design of the present test such a system could not be used, because it was not based on a specific job. Items were therefore selected which it was thought would tax role players sufficiently to provide a large, and if possible, meaningful variability of response between people who took the test.

The basis for items came from five main sources: other published in baskets, incidents personally experienced by the author and colleagues, items suggested by managers, items derived from early attempts to design in baskets with a point to point correspondence with particular jobs, and the imagination of the test designer.

All the items in the tests, together with the fact sheet, job description and organisational chart, were assembled and presented to a number of different people and their comments canvassed. This procedure was similar to the informal try out often associated with more conventional standardised test design.

No meaningful criticisms were made of the items apart from some comments regarding the desire for further information associated with some of them. This problem was regarded as insurmountable because of the necessity of designing an instrument that was manageable, and that could be completed in a reasonable time. This was done to ensure that the test designed was a practical psychological instrument.

Essentially the designer's aim was to get role players to perceive their task as being believable, and not too disparate from a personnel manager's job in a real organisation. Comments during the design of the test confirmed that this was largely achieved. The intention was to get the role players to carry out a simulated job, so that their performance could be judged.

Assuming that the exercise is reasonable and believable, which a number of extramural students who were working in similar jobs said that it was, the method of assessment of the role player's behaviour assumes critical importance, because it is the accuracy with which this can be achieved that determines how well the in basket predicts real life behaviour. The items are shown in their entirety in Appendix 4.

8.6 Methods of Scoring the In Basket Test

There are two general approaches to scoring in basket tests. One involves a complex multivariate approach, where an assessor considers what the role player has done in a highly quantified way by analysing each item on the test through the use of behavioural scoring categories. This technique uses complex scoring sheets and requires the formal training of assessors. The second method, in its most extreme form, involves interviews with candidates after completion of the in basket with a discussion of some of the actions of the candidate on the test. The assessor as a result of this process produces an overall rating of the candidate's performance. A less time consuming variant of this second method is for the assessor to provide the overall assessment without the interview. The second method, being less demanding of time, would appeal more to practitioners and consequently is practical psychology: the other methods cannot really be regarded as such. One of the main aims of this research is to ascertain if there is any substantial advantage in using a multivariate actuarial approach compared to a simple overall assessment of performance on the test. Both methods were used to score the in basket test used in this research.

8.7 The Multivariate Scoring Method

A consideration of the multivariate scoring methods used by the main designers of in baskets reveals a tendency for them to adapt the technique developed by Fredriksen in his work (Frederiksen 1962, Frederiksen Jensen and Beaton 1972) which is fully documented by

Carlton and Brault (1971). Meyer (1970) for example used this technique, but only those categories for which there were split half reliability coefficients over .5. This resulted in 23 categories being deleted from this analysis.

The same approach was used for the present research. The scoring method used by Frederiksen et al (1972) was used in the form carefully recorded by Carlton and Brault (1971). Essentially the method involves two approaches to assessment of performance on the in basket test, scoring for style and scoring for content. The stylistic score, as it implies, is based on the written responses of the role player and so measures how something was done. An example is the degree to which the role player uses outsiders, or the number of times the role player asks for further information. Content scores reflect the courses of action taken by a role player and so measure what was done. The difference between the two measures also involved a methodological distinction which necessitates a separate description of how the scores were obtained.

8.8 Scoring the In Basket test for style of performance

The scoring sheets for marking style are shown in Appendix 5. The numbers at the top of the columns are the scoring categories and the numbers by the rows represent the item numbers. Frederiksen et al (1972) proceed to describe the scoring process: "The scorer reads the response to an in basket item........and then (for most columns) she records a 0 or a 1 in the appropriate cell to indicate the presence or absence of the category of behaviour represented by the column heading." For columns 1, 3, 4, 5, and 6, the scoring procedure is a little different. Estimated Number of Words is coded from 0 (for nothing written) to 4 (for a long response defined as 75 or more words). Scores in columns 3 to 6 represent the number of subordinates, peers, superiors, or outsiders who are involved in the response made by the role player.

The scoring manual (Carlton and Brault 1971) is comprehensive in nature and gives very precise details on how responses are to be interpreted for scoring a particular category. Appendix 6 shows a sample section from the manual by Carlton and Brault dealing with the scoring detail for the Estimated Number of Words scoring category. This provides some indication of the comprehensiveness of the approach. The manual in its entirety is 71 pages in length and provides a series of rules for each scoring category so that scorers can be as sure as possible whether or not to record a particular response.

The design of this scoring method allows for most categories of performance an opportunity for them to occur once in each 'item'. Total scores for all categories are obtained by adding the columns of the scoring forms and adding the sub totals of the two forms. This total is the raw score for a category. The stylistic categories employed are shown in table 8.1. Their name reasonably reflects their meaning, but Carlton and Brault (1971) provide specific details of ways of dealing with actions that are difficult to score.

V1	Estimated no. of words
V2	Uses abbreviations
V3	No. of subordinates involved
V4	No. of peers involved
V5	No. of superiors involved
V6	No. of outsiders involved
V7	Conceptual analysis
V8	Program or physical values
V9	Human values-employee relations
V10	Aware of superiors
V11	Evaluation and development of staff
V12	Aware of poor work
V13	Informality to subordinates
V14	Informality to peers
V15	Informality to superiors
V16	Courtesy to subordinates
V17	Courtesy to peers
V18	Courtesy to superiors
V19	Courtesy to outsiders
V20	Discusses with subordinates
V21	Discusses with peers
V22	Discusses with superiors
V23	Discusses with outsiders
V24	Requires further information
V25	Asks for information from subordinates
V26	Asks for information from peers
V27	Asks for information from superiors
V28	Gives information to superiors
V29	Gives suggestions to superiors
V30	Gives directions to subordinates
V31	Explains actions to subordinates
V32	Explains actions to peers
V33	Explains actions to superiors
V34	Communicates by writing
V35	Communicates face to face
V36	Delays or postpones decision
V37	Procedural decision
V38	Concluding decision
V39	Makes plans only
V40	Takes leading action
V41	Takes terminal action
V42	Schedules work specific day
V43	Schedules work specific week
V44	Indicates time priorities
V45	Refers to peers
V46	Refers to subordinates
V47	Follows lead by subordinates
V48	Follows lead by peers
V49	Follows lead by superiors
V50	Uses pre-established structure
V51	Initiates new structure
V52	Encourages quickness
V53	Sets a deadline
V54	Sets up checks on others
V55	Sets up checks on himself
V56	Concern with proper channels
V57	Responds with specificity
V58	Item not attempted

Table 8.1 The scoring categories used to assess the style scores on the In-Basket test

8.9 Scoring the In Basket test for content of performance

Content of performance was measured by considering the specific courses of action taken by role players. Since the courses of action usually taken are unique to any in basket test, they have to be constructed for any new in basket test that is designed. The process involves a content analysis of a small proportion of the responses to each item, and a list of common courses of action for each item is drawn up. The scorer's job is to decide which course of action, if any, has been taken by a role player, and to record those taken by marking it on the specially designed score sheet. Item 1, for example, is an invitation to give a talk to a Rotary Club on a specific date. A content analysis of some responses to this item revealed the following common courses of action taken (or planned) by different role players:

(a) Agree as a socially responsible company

(b) Ask permission from Mr. Cunningham

(c) Suggest a date

(d) Confirms/Accepts

(d) Passes to Mr. Lowe

(e) Passes to Mr. Myers

(g) Passes to Mr. Wells

(h) Refuses

Appendix 7 shows the categories used for this part of the analysis in their entirety. The scorer's task is to decide which if any of the courses of action were taken by each role player, and tick on the score sheet in the space provided by description of the course of action. Thus if the role players respond that they will go on the date suggested by Mr. Walters, the scorer would tick confirms/accepts on the score sheet for item 1. If the role player takes actions not listed, it is noted on the front of the form in a category called "Unusual action".

In the original scoring method (Carlton and Brault 1971) the total number of ticks on the whole form is regarded as a measure of productivity. It is important to observe at this stage that more than one course of action was possible for each item. They are not mutually exclusive.

The original method also suggests that it is possible to identify two more scores which describe the courses of action taken. One is the number of courses of action judged to be imaginative, and the other is the number of courses of action that involve making organisational change. The latter necessitates the scorer to note such things as a change in personnel, assignment of duties, or procedure that is more than ad hoc. For the present study it was decided to omit these two scores from the courses of action scores. It was found that little agreement could be obtained between scorers about what constituted an imaginative category. There was also little agreement concerning what constituted an ad hoc organisational change, because no explanation for any action taken was required from the role player. As a result this scoring category was also not used. It was felt that the omission of categories at this early stage would not affect to any great extent, the ability to compare results with other studies. It was expected that the reliability study would reduce the number of categories anyway, because categories would have to be dropped from the analysis if they proved unreliable.

Two scores of courses of action were therefore used in the main analysis, they were:

(1) The number of courses of action (v59)

(2) The number of unusual courses of action (v60)

8.10 The Rating of Overall Assessment

Frederiksen et al (1972) also used a complex rating sheet on which scorers were asked to rate such diverse traits as, the emphasis of detail, and concern for quality of work. Since these ratings were never included in their research, because of low reliability coefficients, and the discovery after a factor analysis that no more than one factor could be extracted from the correlation matrix of these ratings, they concluded that: "The scorers were apparently unable to do more than make an overall judgement of the quality of performance " (Frederiksen Jensen and Beaton 1972). These scores were omitted from this study, but the overall judgement of the quality of performance was retained as a rating category. A ten point scale shown in Appendix 8 was used for this purpose.

8.11 How the Plasto In Basket test was Scored

Four people were involved in scoring the 431 in basket tests used in this study. Scorers 1 and 2 marked all the tests using style category scoring sheets A and B, and C and D respectively. Scorers 3 and 4 marked the first 50 tests of the 1977 extramural group only and were used simply to provide data for the reliability study described in the next chapter. Scorer 3 used scoring sheets A and B and Scorer 4 used sheets C and D.

For the courses of action categories, scorer 1 derived scores for all the in basket tests, and Scorer 2 provided scores for the first 50 as a check for the reliability study. Scorer 2 gave an overall assessment of the performance of each role player and scorer 1 gave the same for the first 50, again for the purposes of the reliability study.

As a result of the scoring procedure no one person was responsible for deriving all the scores for any single role player. The procedure took about half an hour for each half of the in basket test the scorer assessed. So an average of an hour was spent marking each test. Comments from the scorers and the results of the reliabilty study affected the choice of variables used in the main study. It is appropriate to consider the reliability study next.

CHAPTER 9

THE RELIABILITY OF THE IN BASKET TEST

9.1 Introduction to Reliability Measurement

The reliability of an instrument is important if the instrument is to gain psychometric acceptance. Practitioners too should be concerned that any judgement made is reliable. Practitioners are nevertheless often unaware of the different methods of ascertaining the reliability of an instrument, and in some cases are perhaps even unaware of the concept at all. Hypothesis 3 in this research is "The overall assessment of performance on the in basket test is a reliable measure of in basket performance". This chapter describes how it was proposed to test this hypothesis and how the reliability of the other variables in the study were also tested so that their adequacy in terms of reliability could be assured for the multivariate analyses contemplated to test some of the other hypotheses.

The reliability literature owes much of its present day sophistication to the area of psychological tests. The construction by Binet and Simon (1905) of the first intelligence test led over the years to a plethora of methods of assessing reliability. Three major methods can be distinguished, each of which has its own function in demonstrating a particular feature of reliability. They are test retest reliability, alternate form reliability, and split half reliability (Anastasi 1976). It is proposed to discuss each in turn and to assess their value in relation to in basket tests. The unique nature of in basket tests also necessitates the introduction of a further reliability measure, inter-scorer reliability, which will be described and discussed later.

9.2 Test retest Reliability

In their discussion of reliability in relation to repertory grid testing, which developed from the personal contruct theory of George Kelly (1955), Bannister and Mair (1968) assert that some aspects of reliability are not appropriate to the method, because of the many different matrices and scoring protocols which are used in repertory grids. As a result there is no one format for the grid which can be said to be the grid and no single coefficient which can be regarded as the reliability of the grid. This view of reliability is similar to Kelly's (1955) own views of reliability and his belief that change can be expected constantly. It is more important to assess predictable stability and predictable change and assess their significance.

This is also true for work sample tests. In techniques such as trainability assessments Downs, (1970) has observed that retesting people on the trainability assessment is not very valid because the essence of the test is the ability of the subject to cope with instructions at a first sitting. The extent to which the subject copes dictates much of the final assessment that is given to candidates on the tests. If subjects have already sat the test they have a substantial advantage over the first time they sit it. In the area of semi skilled selection no pretence is made that subjects can never learn a skill. The aim of trainability assessments is simply to select those people who will learn the job the quickest and with the least trouble for the trainer. A second testing on the same test loses much of the information obtained from the first sitting because of the subject's increased familiarity with the test.

Change of performance is also expected on an in basket test rather than that an individual's performance is stable over time. This is supported by the original use of the in basket test in training and management development, where the method was used to teach people management skills and their improvement was monitored over time (Gill 1978). The use by Frederiksen, Jensen and Beaton (1972) of an in basket test to monitor artificially induced change in the climate of organisations again illustrates how change should be expected in in basket performance rather than the reverse. For the purposes of practitioners, in general terms, work sample tests should not be sat a second time, because of the learning effect, not just through doing the test, but also through the ability to discuss the items with others. No test retest reliability coefficients were calculated in the present research, but considerable attention was given to inter-scorer reliability or the ability of scorers to score categories in the same way. In passing, it is of interest to note that when conducting the validity study, the stability of validity coefficients were considered over separate samples. It was considered unlikely that a test with a low test retest reliability coefficient would generate consistently significant results.

9.3 Alternate Form Reliability

In conventional standardised tests, which are designed to measure a psychological construct like intelligence, it is nearly always possible for more than one form of a test to be devised from the item pool to measure the construct. As a result it is possible to calculate the reliability of a test by getting subjects to sit both forms of the test. This could also be done for in basket tests, but the only score that could be compared from test to test would be that of overall assessment of performance on the test. This is because work sample tests do not have items in the classic psychometric sense. It might be possible to construct similar tests but then the procedure would be liable to the same criticisms as those made against calculating test retest reliability of work sample tests.

9.4 The Meaningfulness of Split-half Reliability Coefficients

The scoring sheets for the stylistic categories of performance are designed so that assessors first score the odd numbered items and then the even numbered ones. Frederiksen et al (1972) designed the sheets in this way to facilitate the calculation of split half reliability coefficients. They were obtained by correlating the subtotals for both halves of the test which are calculated at the bottom of each sheet for all the categories. This procedure was not conducted in the present research, because of the questionable appropriateness of calculating split half reliability coefficients on in basket tests as is argued below.

An argument has been made previously for the difference between work sample tests and more conventional psychological tests. The latter have items which measure a unitary psychological construct, consequently the calculation of the equivalence of two halves of the test would have some meaning. Work sample tests on the other hand, do not have items. So any calculation expecting equivalence would be meaningless, and makes the calculation of reliability coefficients based on the additivity of items, such as Coefficient Alpha (Novick and Levis, 1967) and Guttman's procedure (Guttman, 1945) inappropriate.

This is partly recognised by Frederiksen et al (1972) because it is only the sub totals on the scoring forms that are compared for equivalence, and not the individual items. There is some doubt about the meaning of the reliability coefficient calculated using the subtotals of the categories on the two forms. If the reliability coefficient is low it cannot be really interpreted as questioning the value of the in basket because it is perfectly feasible for assessors to score a particular category more often for certain items compared to others, simply because of the nature of the item. In the design of the in basket test an attempt is made to reasonably reflect a job or a type of work. This is done by presenting the role player with mini situations to deal with, which is another way of viewing in basket test items. Since the literature on leadership indicates quite strongly that the emergence of appropriate leadership and supervision behaviours is quite strongly dependent on the interrelationship between personality and situation (Fiedler 1951 1967) there can be no expectation that an odd even split half reliability coefficient will be high. The idiographic nature of the personality of the role players would ensure this. Another way of looking at this problem is whether there can be any expectation that one half of an in basket is the same as another. The answer must be negative, because if one assumes Downs' (1977) crucial element approach to the design of in baskets there is no requirement that any crucial element should necessarily appear in more than one or two items. Since these items may or may not be evenly divided in the artificial splitting of the in basket test, it further illustrates the rather meaningless exercise of calculating split half reliability coefficients.

The issue can be summed up by saying that a split half reliability coefficient is a measure of internal consistency of a test measured by an expectation that the division of a test in half would give equivalent halves. There is no such expectation with work sample tests, and the in basket test is no exception.

9.5 Inter Scorer Reliability

Inter scorer reliability refers to a vital reliability check of the interpretation of score categories by scorers, and their consistency of scoring.

If inter scorer reliability coefficients for any category are low it must question the value of that category for any hypothesis testing and statistical treatment. It was for this reason therefore that different scorers rescored the first 50 in baskets of the 1977 extramural student group. The exact procedure for scoring the in baskets was given in the last chapter. The reliability coefficients calculated for all the in basket scoring categories including the overall assessment are given in table 9.1. The means and standard deviations for the variables used in this analysis are shown in Appendix 9.

Over the years the testing literature has come to accept correlations of .8 and above as being acceptable reliability coefficients for tests (Anastasi, 1976). The highest reliability coefficient used for the acceptance of variables for further analysis in reliability studies of scoring categories similar to those used in the present research has been .5 (Meyer, 1970). Frederiksen, Jensen and Beaton (1972) have even accepted coefficients as low as .17. For the purposes of this study a reliability coefficient of .7 was regarded as acceptable. The coefficient was set at this level so that in the score rescore reliability analysis at least about 50 per cent of the variance was accounted for. The setting of the level any higher was not considered necessary because the design of the present study in both the factor analysis and the discriminant analysis included further strict reliability checks, both of a methodological nature, through the use of different samples to calculate the statistics. The reliability analysis allows 35 variables using the above criteria to be available for further analysis. They are marked in table 9.1 with a plus next to their name. No data were available for the reliability of the ages of subjects and their sex. It was assumed that subjects were honest in giving this data. The former could have been falsified and the latter may be ambiguous, but it was felt that there were no apparent reasons why the subjects themselves

V1	+	ESTIMATED NO OF WORDS .93
V2		USES ABBREVIATIONS .67
V3	+	NO OF SUBORDINATES INVOLVED .82
V4	+	NO OF PEERS INVOLVED .91
V5	+	NO OF SUPERIORS INVOLVED .88
V6		NO OF OUTSIDERS INVOLVED .66
V7		CONCEPTUAL ANALYSIS .57
V8		PROGRAM OR PHYSICAL VALUES .65
V9		HUMAN VALUES-EMPLOYEE RELATIONS .45
V10		AWARE OF SUPERIORS .35
V11		EVALUATION AND DEVELOPMENT OF STAFF .64
V12		AWARE OF POOR WORK .25
V13		INFORMALITY TO SUBORDINATES .66
V14		INFORMALITY TO PEERS .34
V15		INFORMALITY TO SUPERIORS .02
V16	+	COURTESY TO SUBORDINATES .80
V17	+	COURTESY TO PEERS .82
V18	+	COURTESY TO SUPERIORS .88
V19		COURTESY TO OUTSIDERS .53
V20	+	DISCUSSES WITH SUBORDINATES .87
V21	+	DISCUSSES WITH PEERS .85
V22	+	DISCUSSES WITH SUPERIORS .88
V23		DISCUSSES WITH OUTSIDERS .62
V24	+	REQUIRES FURTHER INFORMATION .74
V25	+	ASKS FOR INFORMATION FROM SUBORDINATES .87
V26	+	ASKS FOR INFORMATION FROM PEERS .71
V27	+	ASKS INFORMATION FROM SUPERIORS .82
V28		GIVES INFORMATION TO SUPERIORS .65
V29		GIVES SUGGESTIONS TO SUPERIORS .62
V30	+	GIVES DIRECTIONS TO SUBORDINATES .91
V31		EXPLAINS ACTIONS TO SUBORDINATES .35
V32		EXPLAINS ACTIONS TO PEERS **
V33		EXPLAINS ACTIONS TO SUPERIORS .03
V34	+	COMMUNICATES BY WRITING .90
V35	+	COMMUNICATES FACE TO FACE .77
V36	+	DELAYS OR POSTPONES DECISION .86
V37	+	PROCEDURAL DECISION .87
V38	+	CONCLUDING DECISION .89
V39	+	MAKES PLANS ONLY .91
V40	+	TAKES LEADING ACTION .90
V41	+	TAKES TERMINAL ACTION .84
V42	+	SCHEDULES WORK SPECIFIC DAY .91
V43	+	SCHEDULES WORK SPECIFIC WEEK .78
V44		INDICATES TIME PRIORITIES .54
V45		REFERS TO PEERS .58
V46		REFERS TO SUBORDINATES .60
V47		FOLLOWS LEAD BY SUBORDINATES .66
V48		FOLLOWS LEAD BY PEERS .66
V49		FOLLOWS LEAD BY SUPERIORS .61
V50		USES PRE-ESTABLISHED STRUCTURE .07
V51		INITIATES NEW STRUCTURE -02
V52	+	ENCOURAGES QUICKNESS .85
V53	+	SETS A DEADLINE .72
V54	+	SETS UP CHECKS ON OTHERS .88
V55	+	SETS UP CHECKS ON HIMSELF .92
V56	+	CONCERN WITH PROPER CHANNELS .81
V57	+	RESPONDS WITH SPECIFICITY .94
V58	+	ITEM NOT ATTEMPTED 1.00
V59	+	NO OF USUAL COURSES OF ACTION .84
V60	+	NO OF UNUSUAL COURSES OF ACTION .82
OVASS	+	OVERALL ASSESSMENT ON THE IN BASKET .79

** NOT CALCULATED INSUFFICIENT VARIANCE

\+ USED IN SUBSEQUENT ANALYSES

Table 9.1 The scoring categories used to assess the style scores and content scores on the In Basket test and their reliabilities should misrepresent them.

One interesting aspect of the results of this reliability analysis is the perfect correlation obtained between the two measurements of 'item not attempted'. This is not too surprising because of the obvious nature of such an occurrence and the inability to score any of the other items if this scoring category was used for any item. It would be surprising if the reliability coefficient for this category was less than perfect.

There appeared to be no real reason for some of the low correlations obtained for some of the scoring categories compared to the higher ones obtained for others. It would seem that despite the comprehensive scoring manual, there was still some considerable uncertainty between scorers about how to categorise some aspects of performance on the in basket tests. Some categories such as 'courtesy to peers' and 'concern with proper channels' were harder to categorise in practice than others such as 'refers to subordinates' or 'indicates time priorities'. This did not seem to affect reliability coefficients however, for the latter were excluded from further analysis because of their unreliability. It could be that some of the more difficult categories to use benefited from an appreciation by scorers of their possible ambiguity, and were used only when a scorer was absolutely certain a particular behaviour had occurred. All this is perhaps speculation, but the complaints by scorers about the length of the scoring process were real, and scorers were left subjectively feeling that consistency was hard to achieve. It is surprising under the circumstances that even 35 variables managed to achieve the pre set reliability coefficient level of .7.

9.6 Discussion

It seems that a direct test of hypothesis 3 using standard methods of assessing the reliability of a test such as test retest or split half methods is not possible because of the unique nature of in basket tests in that they do not have items, which is a common factor of all work sample tests. Inter scorer reliability coefficients were calculated however and it did appear that there was some consistency between scorers of the test. In particular the single variable of overall assessment of performance on the in basket test achieved an acceptable reliability coefficient which gives some confidence in its future use as a method of scoring the in basket test.

CHAPTER 10

FACTOR ANALYSIS AND THE IN BASKET TEST

10.1 The Aims of the Factor Analyses

Factor analyses of the scoring categories used to score the Plasto in basket test were conducted to aid the testing of hypothesis one, so that some rationale could be used for the presentation of variables in the multivariate analyses contemplated. The factor analyses would also help fulfil the subsidiary aim of assessing the value of the multivariate approach for predictive purposes in Applied Psychology. Another purpose of the research was the search for a simpler method of multivariate scoring for the in basket test using any factors which appeared to be consistent with earlier research which used similar scoring categories. This chapter first critically describes earlier attempts at factor analysis of in basket tests, using as a focus the general criticisms of factor analyses in psychology made by Gorsuch (1974).

10.2 Previous Factor Analyses of In Basket Test Scoring Categories

Exploratory Factor Analyses have been applied to in basket tests by a number of researchers (Frederiksen 1962, Frederiksen Jensen and Beaton 1974, Meyer 1970). Unfortunately there has been a tendency for research using factor analysis to be of an individual nature and for one set of research not to make use of another. This has made it difficult for factor analysis to be used for its more useful functions of the testing of hypotheses about the structuring of variables in terms of the expected number of significant factors and factor loadings. Its use as a measuring device for the construction of indices which could be used as new variables in later analysis (Nie et al, 1974) has also been inhibited.

In this respect research on the in basket test is perhaps no different from a considerable amount of research in psychology using factor analysis. Gorsuch (1974) has criticised the way factor analysis has been used in the psychological literature. His criticisms are summarised in table 10.1. The summary provides a useful structure for determining the progress made in research on a subject using factor analysis, and it is particularly illuminating to apply it to factor analytic studies carried out on the in basket test.

Gill (1979) in his review of the in basket test, while not specifically committing the first error cited by Gorsuch (1974) (see table 10.1) certainly encourages the reader to believe that there are two well founded factors that have been consistently found in the literature: "Meyer (1970) found however that a factor analysis of in basket ratings of 81 subjects produced two major in basket dimensions: supervision, a human relations dimension, and planning/administration, an intellectual dimension. This finding tends to be supported by many other studies too." Gill (1979). Unfortunately the factor analysis Gill quotes was not done by Meyer on the in basket test he used in his research, but on the appraisals of observed job performance of the 81 managers who took the in basket test. Meyer(1970) in fact extracted four factors from the in

1. It is assumed that factors from one particular research study are <u>the</u> factors.

2. Insufficient attention is given to the selection of variables.

3. Research studies often fail to report what was actually done in sufficient detail so that the analysis can be approximated to another study.

4. There appears to be a heavy reliance on computer package programmed factor-analytic procedures because of their availability rather than because the study was designed for that type of analysis.

5. Factors already well replicated in a standard area are often re-discovered and given a new name.

6. A major criticism underlying all the others: the lack of a theoretical approach which integrates the data collection, factor analysis and interpretation, and which leads to future use of the results.

Table 10.1 A summary of major criticisms of the way factor analysis is practised (after Gorsuch 1974).

basket test data after conducting a centroid factor analysis with an oblimin solution. He called the factors preparation for decision, takes final action, organising systematically and orienting to subordinate needs. It is hardly surprising that Gill cites no research for the support he quotes Meyer's factor analysis has received.

Gorsuch's second criticism of factor analytic studies concerning the insufficient attention given to the selection of variables used in factor analysis can with some legitimacy be ascribed to research on the in basket test. While studies such as those of Frederiksen (1962), Meyer(1970) and Frederiksen Jensen and Beaton (1972) have paid considerable attention to the calculation of reliability coefficients of variables for the purpose of justifying their inclusion in a factor analysis, there has been no real agreement about the value of the reliability coefficient that a variable must achieve to allow it to remain in the analysis. Frederiksen (1962) chose scores with reliabilities ranging from .19 to .87, Meyer (1970) chose scores with reliabilties between .50 and .95, and Frederiksen Beaton and Jensen (1972) chose scores with reliabilities above .17. As one might expect, despite these researchers using essentially the same scoring categories, the rather more demanding reliability coefficients required by Meyer's study meant that more variables were excluded from his factor analysis than were excluded from the other two pieces of research done by Frederiksen. Even so a .5 reliability coefficient is hardly high by psychometric testing standards, which often sets an arbitrary figure of .8 (Anastasi 1976). Perhaps a reasonable compromise for selection into a factor analysis would be reliability coefficients of .7 or so and above, where at least 50 per cent of the variance between two scores on the same test was accounted fôr.

Gorsuch in his third criticism accuses many researchers of not reporting factor analysis in sufficient detail so that research can be compared from study to study. Frederiksen's work certainly cannot be criticised for this. His 1962 monograph describes in great detail the procedures carried out in the factor analysis and the same sort of detail is present in his 1972 work. Meyer (1970) unfortunately does not present all the loadings for all the variables in the factors he extracts and names. Their presentation is essential if there is to be any hope of confirming the factors extracted in his study. A consideration of the loadings Meyer presents shows no consistent lower loading level at which variables are considered as significantly loading on a factor. Factor 1's lowest loading is .33 for example, while the lowest loading presented on factor 3 is .45. Meyer leaves himself open to the possible accusation that some variables are omitted from consideration as loading on a particular factor because they increase the difficulty of psychologically interpreting a factor. McNemar (1951) cites this as a common error in the presentation of the results of factor analysis.

Gorsuch's fourth criticism of factor analytic studies has to a certain extent been overtaken by the increasing sophistication of many of the statistical packages available to psychologists. There is no real evidence from the literature on in basket tests that researchers have fallen into the trap of using computer packages because of their availability. In fact Frederiksen in both his studies presents in some detail the methods he used. Past factor analyses of the in basket test justify the use of a particular method more on the nature of the data rather than the availability of particular computer programmes. Gorsuch's fifth criticism regarding the rediscovery of factors is hardly applicable to the area of in basket tests. The problem seems to be more the difficulty of identifying any factors that studies have in common. In Frederiksen's study in 1962 for example the author suggested that the first factor he extracted was similar to a factor (not the first factor) of a factor analysis of in basket tests done by school principals (Hemphill Griffiths and Frederiksen 1962). Table 10.2 shows the variables with their loadings on the two factors.

Using the coefficient of congruence (Burt 1948, Tucker 1951, Wrigley and Neuhaus 1955) a test was made of how well the two factors do in fact match. The formula for the coefficient is:

$$C_{12} = \frac{\Sigma \, Pv_1 \, Pv_2}{\sqrt{\Sigma \, Pv_1^{\,2}} \; \sqrt{\Sigma \, Pv_2^{\,2}}}$$

where c12 is the coefficient of congruence between factor 1 and factor 2, pv1 are the factor loadings for the first factor and pv2 are the factor loadings for the second factor. The result of calculating coefficients of congruence on the factor pattern is identical to correlating the exact factor scores, when they are available, and the formula is in fact a simplification of that correlation. The calculation of the coefficient of congruence of the data in table 10.2 produces a coefficient of .94. This was calculated by omitting the variable 'socially insensitive' from the

	Loading on Frederiksen Factor A 1962	Loading on factor from Hemphill et al. 1962
Follows lead by subordinates	.62 (1)*	.65 (3)*
Follows lead by superiors	.62 (1)	.50 (5)
Communicates by writing	.61 (3)	.45 (7)
Concluding decision	.58 (4)	.73 (1)
Terminal action	.56 (5)	.59 (4)
Socially insensitive	.53	- -
Number of items attempted	.52 (6)	.68 (2)
Number of superiors involved	.36 (7)	.06 (11)
Estimated number of words written	.33 (8)	.33 (8)
Number of outsiders involved	.29 (9)	.08 (12)
Leading action	.22 (10)	.10 (10)
Number of subordinates involved	.21 (11)	.31 (9)
Follows pre-established structure	.21 (12)	.48 (6)

Table 10.2 A comparison of loadings on two factors on an In Basket test from Frederiksen (1962) and Hemphill Griffiths and Frederiksen (1962) (After Frederiksen 1962)

* Numbers in brackets show the rankings in terms of magnitude of the loadings on the two factors

analysis.

By any standards this is a very strong relationship between the two factors if the value of the coefficient of congruence is taken at face value. This of course cannot be done because of the missing socially insensitive variable in the Hemphill et al study and the problem that the loadings obtained by Hemphill et al were not in the first factor extracted, and would not have been accounting for similar amounts of variance. By not directly comparing all the factors as they were extracted or with a stated rationale, it opens the comparison made by Frederiksen to the criticism that the coefficient is a chance result because the calculation fails to take into consideration the relationship between the other factors extracted by Hemphill et al and those extracted by Frederiksen. Pinneau and Newhouse (1964) have also pointed out that the coefficient of congruence is highly influenced by the level and by the sign of the loadings. Factors whose loadings are the same size will of necessity have a high coefficient of congruence even if the patterns of loadings are unrelated. The salient variable similarity index , a non parametric technique devised by Cattell (1949) is a possible alternative for comparing factor loadings, except that it too can only be applied when there is external evidence that the two factors chosen should be matched. Frederiksen (1962) does not adequately provide such evidence and so even the visual matching of factors he adopts must be viewed with care, for he extracted eight factors in his study which would further depress the coefficient of congruence obtained. It is also important to know that this factor was not found in Meyer's analysis or Frederiksen et al's work in 1972.

Gorsuch's sixth criticism of psychological studies incorporating factor analysis is of a more general nature. He believes that a large number of studies lack a theoretical approach to factor analysis. Many use the technique because editors of journals require a sophisticated treatment of data or because a tradition is set up in an area for a factor analysis of the data to be done without really providing an explanation for why the factor analysis was carried out. Factor analyses of in basket tests seem to fall in the latter category. Frederiksen (1962) for example gave his reasons for conducting a factor analysis of scores obtained on the in basket "as a means for revealing whatever major dimensions of behaviour that may exist in the data". Similarly Meyer (1970) conducted his factor analysis "to identify more general aspects of in basket performance". The problem with these two rather vague reasons for conducting factor analyses is that interpretable factors can be obtained from random data (Horn 1967; Armstrong and Soelberg 1968), and so rather more precise statements about the possible grouping of variables, or an inbuilt replication in the study are required, if any generalisable factors across studies are to emerge. Any extracted factors would also need to be replicated in different studies and subsequently integrated into a more precise theoretical framework. Frederiksen Beaton and Jensen (1972) give their reasons for conducting a factor analysis as the redundancy evident in the large number of intercorrelations between the fifty five scores used in the in basket test. They go on to say "In the interest of parsimony as well as computational efficiency, it is desirable to combine scores in a way which will preserve most of the information and reduce the number of variables appreciably." A more considered reason for conducting factor analysis perhaps, but their approach is spoilt somewhat with the lack of a theoretical structure for factors before they are extracted. Only passing reference is made to other factor analyses in the area, with the result that the analysis is conducted and perhaps fulfils the requirements of the study, but does not lead to much progress in terms of establishing if general factors of administrative performance do exist. The lack of exact replication and problems of design cannot yet lead to the conclusion that these factors do not exist in administrative tasks as measured by the in basket test.

The analysis made by Gorsuch of the use of factor analysis in psychology is intended as a plea for better use of the technique rather than the unthinking way it seems to be applied in many instances in psychological research. In an attempt to encourage this process he developed a decision-making algorithm to help researchers use factor analysis, similar to well documented attempts in other areas, such as Pearn's training decision algorithm (Pearn 1970). The algorithm is reproduced as figure 10.1 and is used as a basis for considering factor analysis as a research tool in the present research.

10.3 Factor Analysis of the Plasto In Basket Test

Gorsuch's (1974) model was used to see if factor analysis was an appropriate technique to use on the in basket test. Use of the model requires a theoretical justification for the use of factor analysis before considering the appropriateness of a particular statistical technique. This was given in the first section of this

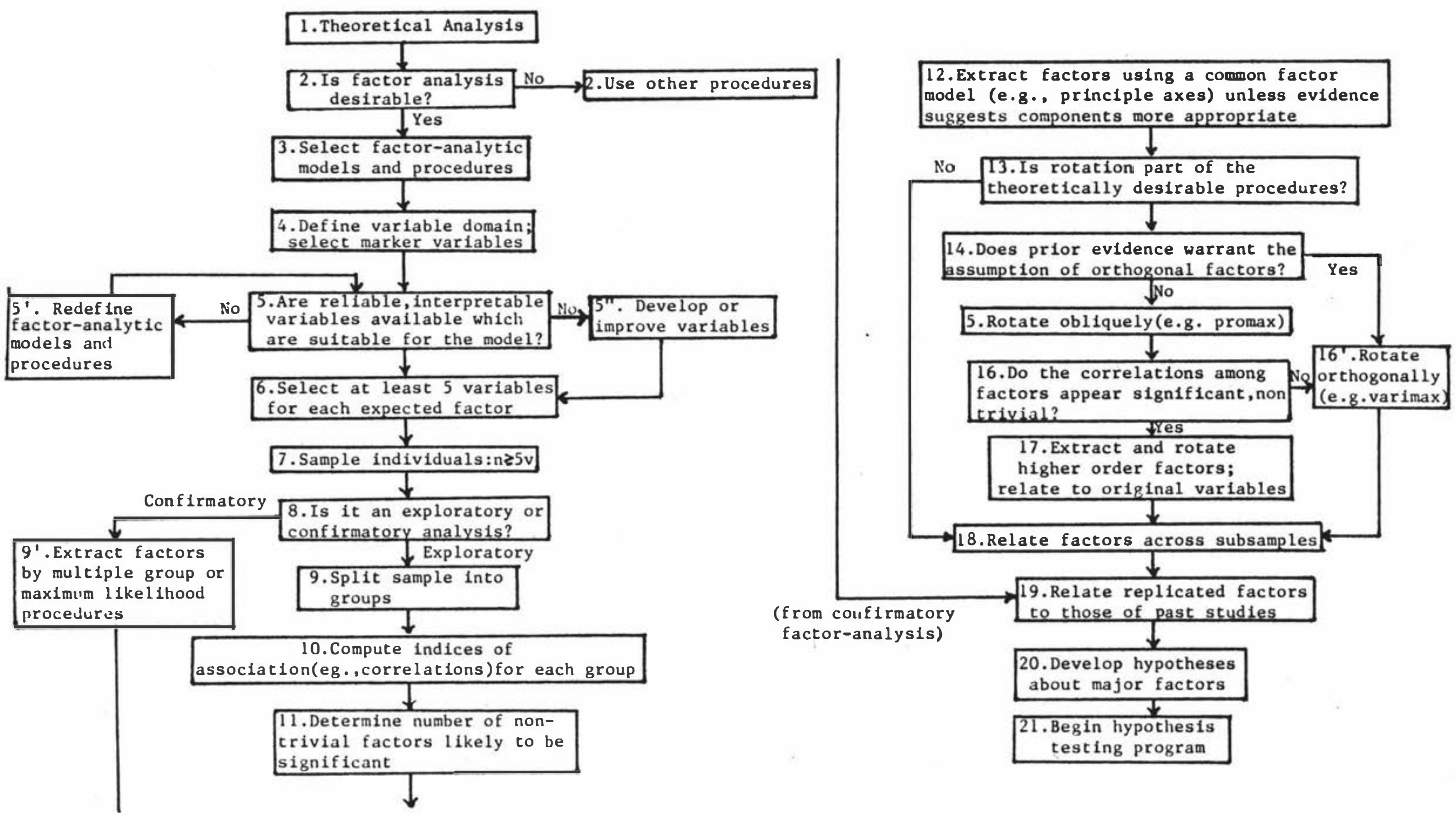


Figure 10.1 An algorithm for decision making when using Factor Analysis (from Gorsuch, 1974)

chapter.

10.4 The Methodology of the Factor Analytic Study

No alterations to the scoring scale used by Frederiksen (1972) have been made so the necessity of ensuring that there are marker variables as advocated by Gorsuch (1974) (variables which are included from past research so that the results of the new study can be directly compared to them) is not necessary. Using Meyer's (1970) study as a base, because he adopted more acceptable reliability coefficients for inclusion of variables in his analysis, Meyer extracted four factors which using the rule of thumb set out by Gorsuch in 6 in figure 10.1 means there should be 20 variables in the analysis. This study in fact included 35 variables after the reliability analysis that were directly comparable to those used by Meyer. These variables are presented again for convenience in table 10.3.

Also included in the factor analysis were the variables of age and sex. The former was coded as the actual age of the role player and the latter was coded 1 for male and 2 for female. The variable of sex was included to see if any particular factor could be attributed to different responses between males and females which would be shown up by a high loading by this variable on an extracted factor. The measure of overall assessment was included to discover more about the relationship of this variable to the very specific scoring of the stylistic and content categories.

VARIABLE LIST

VARIABLES..	LABELS..
V1	ESTIMATED NO OF WORDS .93
V3	NO OF SUBORDINATES INVOLVED .82
V4	NO OF PEERS INVOLVED .91
V5	NO OF SUPERIORS INVOLVED .88
V16	COURTESY TO SUBORDINATES .80
V17	COURTESY TO PEERS .82
V18	COURTESY TO SUPERIORS .88
V20	DISCUSSES WITH SUBORDINATES .87
V21	DISCUSSES WITH PEERS .85
V22	DISCUSSES WITH SUPERIORS .88
V24	REQUIRES FURTHER INFORMATION .74
V25	ASKS FOR INFORMATION FROM SUBORDINATES .87
V26	ASKS FOR INFORMATION FROM PEERS .71
V27	ASKS INFORMATION FROM SUPERIORS .82
V30	GIVES DIRECTIONS TO SUBORDINATES .91
V34	COMMUNICATES BY WRITING .90
V35	COMMUNICATES FACE TO FACE .77
V36	DELAYS OR POSTPONES DECISION .86
V37	PROCEDURAL DECISION .87
V38	CONCLUDING DECISION .89
V39	MAKES PLANS ONLY .91
V40	TAKES LEADING ACTION .90
V41	TAKES TERMINAL ACTION .84
V42	SCHEDULES WORK SPECIFIC DAY .91
V43	SCHEDULES WORK SPECIFIC WEEK .78
V52	ENCOURAGES QUICKNESS .85
V53	SETS A DEADLINE .72
V54	SETS UP CHECKS ON OTHERS .88
V55	SETS UP CHECKS ON HIMSELF .92
V56	CONCERN WITH PROPER CHANNELS .81
V57	RESPONDS WITH SPECIFICITY .94
V58	ITEM NOT ATTEMPTED 1.00
V59	NO OF USUAL COURSES OF ACTION .84
V60	NO OF UNUSUAL COURSES OF ACTION .82
OVASS	OVERALL ASSESSMENT ON THE IN BASKET .79
SEX	
AGE	

Table 10.3 Scoring categories with reliability coefficients .7 and over accepted as variables for further analysis. (Age and sex were also used but no reliabilty coefficients were computed for these variables)

All the loadings for all the variables on the factors are not provided by Meyer in his paper so the factor analytic study proposed must still be exploratory.

The splitting of the sample into groups, which is a requirement of an exploratory factor analysis, was done by creating a variable with a mean of zero and a standard deviation of .5 and assigning these values randomly to all cases in the sample. Cases which had values greater than zero formed one group and cases which had values less than zero formed the other group. This randomisation process was conducted through data modification cards available in the Statistical Package for the Social Sciences (Nie et al 1974). The factor subprogram of this computer package contained all the necessary factoring and rotational methods to analyse the data. The more flexible Genstat package (Alvey et al 1977) with its ability to manipulate matrices to incorporate unusual factoring and rotational methods was also available but was not used in this research because no unusual factoring methods were contemplated.

The means and standard deviations and the number of cases associated with each variable in each group are presented in tables 10.4 and 10.5. As can be seen, the randomisation process does not split the groups exactly equally. It might be expected that the total number of cases of the split groups might not equal the total available sample because cases given a value of zero would not appear in either group. The random distribution is, however, computed to five decimal places and so the probability of a case actually being given a value of 0.00000 on the variable is very small. In this exploratory factor analysis all the cases were used in the

VARIABLE	MEAN	STANDARD DEV	CASES
V1	65.4286	13.4533	210
V3	27.2524	10.8057	210
V4	5.8333	4.3480	210
V5	6.1810	3.5535	210
V16	6.8571	2.6301	210
V17	1.0238	1.1998	210
V18	2.9905	2.1476	210
V20	8.0810	3.4886	210
V21	2.5524	2.0820	210
V22	2.0476	2.0975	210
V24	0.7048	1.0974	210
V25	4.9952	2.9404	210
V26	0.9762	1.0912	210
V27	0.8619	1.2736	210
V30	6.0333	4.0610	210
V34	15.9000	4.3003	210
V35	15.5190	4.3487	210
V36	0.5000	0.9446	210
V37	13.0571	3.8521	210
V38	15.8810	4.0723	210
V39	0.8095	1.1162	210
V40	13.2048	3.7469	210
V41	15.2429	3.6931	210
V42	3.0762	3.9097	210
V43	0.3619	0.7003	210
V52	0.4381	0.7568	210
V53	0.4667	1.0359	210
V54	1.5524	1.6600	210
V55	0.5571	1.0889	210
V56	0.0286	0.1670	210
V57	15.5286	6.2760	210
V58	0.1048	0.4777	210
V59	37.8333	6.4330	210
V60	1.4714	1.7283	210
OVASS	5.2905	1.5518	210
AGE	30.1310	9.4954	168
SEX	1.3486	0.4779	175

Table 10.4 Means, standard deviations and number of cases in sample A

VARIABLE	MEAN	STANDARD DEV	CASES
V1	67.0407	12.9549	221
V3	28.4118	11.7611	221
V4	5.9276	4.1881	221
V5	6.0633	3.4424	221
V16	6.9140	2.5861	221
V17	1.0950	1.1540	221
V18	2.9955	2.1627	221
V20	7.8733	3.4235	221
V21	2.5837	2.0290	221
V22	1.9186	1.7768	221
V24	0.6878	0.8981	221
V25	5.0679	3.2613	221
V26	0.9729	1.2465	221
V27	0.8462	1.1847	221
V30	5.9186	3.9752	221
V34	15.4977	4.6657	221
V35	15.1629	4.7281	221
V36	0.4706	0.8714	221
V37	12.6244	4.1263	221
V38	15.9502	4.3955	221
V39	1.0498	1.6576	221
V40	12.9005	4.1919	221
V41	14.7557	4.2655	221
V42	3.1810	4.0557	221
V43	0.3077	0.6778	221
V52	0.5475	1.0374	221
V53	0.5023	1.0687	221
V54	1.4842	1.6254	221
V55	0.4299	0.8999	221
V56	0.0136	0.1160	221
V57	16.7511	5.6590	221
V58	0.4163	2.5223	221
V59	38.0995	9.2877	221
V60	2.2851	7.2127	221
OVASS	5.4977	1.5094	221
AGE	30.5056	8.8344	178
SEX	1.3596	0.4812	178

Table 10.5 Means, standard deviations and number of cases in sample B

preliminary split group treatment. The correlation coefficients between the variables for all the analyses are shown in Appendix 10.

The split group procedure is useful in factor analysis for determining the stability of loadings because exploratory factor analysis has the problem of capitalising on chance which limits the generalisability of the results. The stability check is therefore necessary, but if a comparison of loadings is to be made available for future research and comparisons made of loadings with past research, a factor analysis of the total sample is used. The split group loadings are used to determine whether a particular loading on a variable is inherently stable enough to be included in an extracted factor. The use of a second factoring method provides a further check, and was carried out. The methodology and results of an image factor analysis of the data are presented in a later section.

The split groups, called for convenience A and B, were individually factored using the principal axes method with orthogonal varimax rotation. This procedure was also carried out on the total sample of 431 in baskets. Since little was known about the nature of the data it seems appropriate not to assume a large common factor, which would have impelled the use of the Principal Components factoring method, but it was intended to check the results using other procedures after this initial factoring had been completed. Varimax rotation of the factor matrices was employed because it concentrates on simplifying the columns of a factor matrix. At its simplest level, varimax attempts to define a simple factor as one with only 1's and 0's in the column. In other words it tries to get variables to load high or low on factors. This aids psychological interpretation, and consequently it is the most widely used rotational procedure in the psychological literature at present (Nie et al 1974).

There are two general methods of extracting factors from factor analysis: a mathematical/statistical approach, and an approach based on the subjective ability to attribute psychological meaning to a factor through considering the loadings of individual variables on them. All factor analyses in psychology should include both methods. The mathematical/statistical control of the extraction of factors was exercised in this preliminary analysis and in all subsequent factor analyses in this study through the accepted convention (Nie et al, 1974) of deleting all factors with an associated eigenvalue or characteristic root of less than one. Using this criterion thirteen factors were extracted using group A and twelve were extracted for group B and the analysis using the whole sample. The mathematically extracted factors for both A and B groups and the whole group are shown in their entirety in the form of varimax factor matrices in tables 10.6, 10.7, and 10.8. Table 10.9 shows the loadings for four factors and the names given to the factors which appeared to be interpretable psychologically and fulfilled other criteria for extraction as factors which are outlined in the next section.

VARIMAX ROTATED FACTOR MATRIX

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5	FACTOR 6	FACTOR 7	FACTOR 8	FACTOR 9	FACTOR 10
V1	0.17137	0.84121	0.13390	0.14413	0.00871	0.09097	0.09865	0.15695	-0.04260	-0.12731
V3	0.26101	0.19124	-0.04232	0.13035	0.24852	0.24971	0.21997	0.24445	0.12554	-0.18670
V4	0.11487	0.16552	0.00469	0.96784	-0.00560	0.09255	0.02708	-0.00666	0.03023	0.03397
V5	0.09027	0.12221	0.74213	0.19945	-0.05030	0.45166	-0.02805	-0.07027	0.08802	-0.01676
V16	-0.18964	0.25039	-0.10950	0.13956	-0.00830	0.35646	0.13099	0.25384	-0.02798	-0.11381
V17	-0.02739	0.14213	0.03943	0.46246	-0.02916	0.29915	0.10707	0.05456	-0.27553	-0.12918
V18	-0.02103	0.15718	0.05290	0.11752	0.01589	0.88002	0.03470	0.06108	0.09332	0.06908
V20	0.45951	0.05856	0.10965	0.05366	-0.03802	0.10860	0.26669	0.25516	-0.01251	-0.34282
V21	0.22939	0.10495	0.11577	0.60331	0.13532	0.03359	0.06665	0.08207	0.04037	-0.09168
V22	0.06856	0.08288	0.88848	0.06748	-0.08186	-0.19678	-0.06669	0.09497	0.03280	-0.01490
V24	0.00559	0.18992	0.06309	-0.19738	-0.13406	-0.02989	-0.20811	-0.36807	0.04089	0.09137
V25	0.04748	0.08740	-0.12355	0.03549	0.80068	0.03624	0.11003	0.04106	0.14408	0.19023
V26	-0.10523	0.10370	-0.02483	0.24297	0.03158	0.06326	-0.08760	0.01897	0.21228	0.30908
V27	0.12130	0.10207	0.61123	-0.08152	-0.04985	0.03140	0.02820	-0.09329	0.04877	0.00316
V30	0.02790	-0.09033	-0.05662	0.05155	0.77971	-0.02983	0.17623	0.23455	-0.06225	-0.02990
V34	-0.44698	0.20662	-0.09449	0.03627	0.05617	0.18227	0.18727	0.05215	-0.06188	0.11471
V35	0.61244	0.03708	0.24312	0.14921	0.14269	0.02711	0.17632	0.20079	0.23556	-0.27148
V36	0.08861	-0.11187	-0.11905	-0.02153	-0.04387	-0.07367	-0.10437	0.03718	-0.69800	0.01969
V37	0.90153	0.08225	0.10051	0.10429	0.04902	0.03423	0.08648	0.04825	0.08751	-0.10177
V38	-0.92695	-0.05536	-0.07360	-0.08733	-0.04223	-0.05144	0.07885	-0.06497	0.16657	0.15137
V39	-0.10642	0.13648	-0.11721	-0.03325	-0.25428	-0.04870	-0.04237	-0.14553	-0.15632	0.16108
V40	0.93354	0.05147	0.06438	0.04657	0.03179	-0.07708	0.08109	0.10000	0.06698	0.06820
V41	-0.94282	-0.06301	-0.02301	-0.02772	0.03047	0.05911	0.03588	-0.09841	0.15141	-0.08367
V42	0.20833	0.15166	-0.02980	-0.08652	0.19166	0.01222	0.05012	0.58251	-0.04189	-0.10551
V43	0.11487	-0.01754	0.00968	0.03213	-0.08350	-0.00728	0.10762	0.18882	0.01586	-0.12542
V52	0.05573	-0.02780	-0.00626	0.04653	-0.04557	-0.01620	0.11399	-0.02311	-0.03576	0.09746
V53	0.05749	0.14860	0.05900	0.01835	0.16783	0.11603	0.00204	0.43455	-0.06677	0.16506
V54	0.22468	0.09294	0.07340	-0.03896	-0.11881	0.08942	0.03081	-0.10461	0.23340	0.00657
V55	-0.05152	0.10770	-0.02247	0.08874	0.13655	0.00100	0.03991	0.07068	-0.11628	0.01300
V56	-0.09893	0.08764	-0.00538	0.05470	-0.05690	0.00086	-0.05601	0.05060	-0.15789	0.03460
V57	0.01551	0.87363	0.12051	0.10251	-0.08072	0.10581	0.05161	-0.07838	0.03550	0.01794
V58	-0.01700	-0.06570	0.07160	-0.03339	-0.03959	0.01754	-0.47967	-0.11449	-0.03117	-0.08288
V59	0.22722	0.37987	0.26569	0.18847	0.18407	0.24233	0.49064	0.00803	0.05251	-0.26546
V60	-0.01083	-0.13488	-0.03155	-0.00828	-0.19014	-0.06891	-0.72953	-0.03751	-0.06683	0.12507
OVASS	0.06646	0.60141	0.06763	0.08290	0.11885	0.10102	0.24630	0.07820	0.21630	0.12494
AGE	0.23794	-0.11687	-0.13282	0.27484	-0.02646	0.04006	0.13107	0.37097	0.06744	-0.18062
SEX	-0.06147	-0.05112	0.00427	-0.09480	0.07128	0.00855	0.02586	-0.10309	-0.04618	0.47899

Table 10.6 Full varimax rotated factor matrix for group A.

	FACTOR 11	FACTOR 12	FACTOR 13
V1	0.00814	0.01378	0.07871
V3	0.15563	0.10375	0.02005
V4	0.06311	0.03464	0.07336
V5	0.02709	0.03399	-0.02770
V16	0.15094	-0.28551	-0.06786
V17	0.08455	-0.26199	0.10703
V18	0.05536	-0.00046	0.07793
V20	-0.04010	0.33148	0.16260
V21	-0.07312	0.21456	-0.01626
V22	-0.03901	0.00028	-0.12689
V24	0.04715	-0.06358	0.10758
V25	0.08177	-0.13331	0.13259
V26	0.13068	0.04168	0.11009
V27	0.03319	-0.01646	0.14624
V30	0.04719	-0.01047	-0.00754
V34	0.57801	-0.01328	-0.00203
V35	-0.18092	0.16675	0.21116
V36	-0.05666	0.13174	0.05784
V37	0.00776	0.02570	0.02710
V38	0.07917	-0.03985	-0.00394
V39	-0.51413	-0.14062	-0.20039
V40	0.18212	-0.02571	0.03383
V41	0.08147	0.08745	0.05785
V42	0.03001	-0.02433	0.01706
V43	0.13858	0.05471	0.02630
V52	0.05439	0.48896	-0.07781
V53	0.07871	0.01264	0.26942
V54	-0.01033	-0.18637	0.42045
V55	0.08248	-0.06887	0.39101
V56	0.02614	0.23326	-0.07166
V57	-0.06578	-0.01475	0.02763
V58	0.03491	-0.04489	-0.04967
V59	0.16485	0.14418	0.04513
V60	-0.16323	0.00066	0.00775
OVASS	0.10059	0.01690	0.22757
AGE	0.10524	-0.14928	-0.13602
SEX	-0.07214	0.17158	0.01147

Table 10.6 Full varimax rotated factor matrix for group A.

VARIMAX ROTATED FACTOR MATRIX

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5	FACTOR 6	FACTOR 7	FACTOR 8	FACTOR 9	FACTOR 10
V1	0.16465	0.78477	0.08362	0.14566	0.10435	0.11922	0.29536	0.07262	0.06084	0.18278
V3	0.13286	0.22399	0.48985	0.25529	0.26253	0.08581	0.06007	0.11745	0.12273	0.07794
V4	0.04387	0.05151	0.19597	0.95624	0.02916	0.11898	0.00804	0.06841	0.08272	0.10295
V5	0.06874	0.24663	0.11479	0.06992	0.08970	0.70245	0.01444	0.61365	-0.03121	0.09208
V16	-0.07573	0.30487	-0.03038	0.30692	0.06979	-0.13037	0.21108	0.28521	-0.03361	0.11200
V17	-0.05164	0.07303	-0.00181	0.30676	-0.04015	-0.13283	0.08849	0.18283	-0.06705	0.18778
V18	-0.08330	0.15535	0.02333	0.12745	0.00789	0.06879	0.00676	0.68885	-0.06034	0.08602
V20	0.22669	0.09348	0.73531	0.01579	0.14310	0.10905	0.13662	-0.04780	0.05917	0.17310
V21	0.23092	0.03184	0.36722	0.53445	0.06006	0.19407	0.00552	0.09093	0.08476	0.06194
V22	0.02336	0.12334	0.18447	0.06524	0.14679	0.79697	0.00132	-0.08013	0.17905	0.03233
V24	0.06325	0.07936	-0.05995	-0.00724	-0.01663	0.12861	0.02636	0.05285	-0.13849	-0.23625
V25	-0.03155	0.21304	0.14419	0.10688	0.74903	0.07258	0.02251	0.09478	0.02114	-0.06161
V26	0.00560	0.09841	-0.01818	0.51539	0.10929	0.00696	0.02740	0.03212	-0.01503	-0.16603
V27	0.03769	0.03966	0.01543	0.04234	0.03131	0.52183	0.03137	0.08316	0.06557	-0.10385
V30	0.07785	0.02870	0.18495	0.01887	0.86705	0.08686	0.07142	0.00616	0.21167	0.06070
V34	-0.48429	0.18471	-0.05236	0.04166	0.31100	-0.03641	0.22024	0.41287	0.32086	0.07739
V35	0.55474	0.09155	0.56121	0.14841	0.11397	0.15925	0.18448	-0.04893	0.06231	0.00213
V36	0.06825	0.02882	-0.20354	-0.05545	0.01138	-0.06344	0.03935	-0.10151	-0.02371	-0.10307
V37	0.82322	0.07910	0.29075	0.06027	0.08346	0.02636	0.30111	0.03490	0.12940	0.15902
V38	-0.87852	0.03854	-0.07149	-0.00778	-0.02111	-0.01484	0.25015	0.03653	-0.08396	-0.04609
V39	-0.02627	0.13534	-0.44289	-0.18637	-0.16795	0.06128	0.16046	-0.42781	-0.31752	-0.01411
V40	0.82427	0.10448	0.27125	0.08378	0.10695	-0.02282	0.26886	0.07979	0.15907	-0.00933
V41	-0.88805	-0.01812	0.10351	0.02839	0.04361	-0.00430	0.22406	0.13575	-0.01256	0.04348
V42	0.18851	0.13789	0.14643	-0.03425	0.04054	-0.03441	0.06568	0.09319	0.57044	-0.06872
V43	0.05807	-0.06633	0.00783	0.07011	0.10080	-0.00038	-0.00386	-0.02860	0.23856	-0.05408
V52	0.12989	-0.02512	0.01949	-0.13742	0.09281	0.02367	0.09443	0.01838	0.02177	0.16698
V53	0.14774	0.12592	0.00612	0.10288	0.30509	0.07533	-0.01291	-0.06265	0.41886	0.08590
V54	0.05024	0.09485	-0.03555	0.03457	-0.01351	0.02430	0.01032	-0.09520	-0.03489	0.11090
V55	-0.01512	0.00228	0.09855	-0.03013	0.02783	0.13153	-0.00134	-0.00520	0.30983	0.10526
V56	0.03780	0.02350	0.07174	0.03468	0.04813	-0.08426	-0.00437	0.02117	-0.11265	0.02355
V57	-0.03159	0.86222	0.03188	0.11473	0.04177	0.09331	0.03061	0.06221	-0.06855	0.00685
V58	0.08144	-0.23026	-0.16875	-0.08317	-0.06521	-0.02029	-0.91070	-0.00588	-0.02101	-0.05571
V59	0.02252	0.28174	0.44793	0.14517	0.26504	0.18124	0.34732	0.19528	0.18731	0.10846
V60	-0.02242	-0.12668	-0.07776	-0.06095	-0.01295	-0.07585	-0.16796	0.00304	-0.01725	-0.10169
OVASS	0.01989	0.55607	0.17447	0.02321	0.24873	0.08979	-0.00133	0.20582	0.18239	-0.07303
AGE	0.09391	-0.01875	0.10669	0.15409	0.11103	-0.07867	0.08959	0.16435	0.01166	0.58350
SEX	0.02428	-0.08025	-0.05133	0.05980	0.07036	-0.03417	0.02736	0.00232	-0.00636	-0.42342

Table 10.7 Full varimax rotated factor matrix for group B.

	FACTOR 11	FACTOR 12
V1	-0.00493	-0.10272
V3	-0.14232	0.01822
V4	0.04658	-0.03549
V5	0.02913	-0.00842
V16	-0.12890	0.03620
V17	-0.00321	0.09207
V18	-0.01267	0.03065
V20	-0.01009	-0.06074
V21	0.03377	-0.09652
V22	0.05728	-0.03391
V24	0.46708	0.02169
V25	-0.01715	0.06209
V26	0.04554	-0.03223
V27	0.34830	-0.05639
V30	-0.06377	-0.03578
V34	0.08709	-0.05954
V35	0.06694	-0.08916
V36	-0.32514	-0.08577
V37	0.14560	-0.06406
V38	0.07644	-0.03809
V39	-0.14149	0.05333
V40	0.15320	-0.09876
V41	0.04543	-0.05318
V42	-0.20330	0.01289
V43	-0.14467	0.00476
V52	-0.03073	-0.07978
V53	0.05041	-0.05698
V54	0.44391	-0.05999
V55	0.08479	-0.00659
V56	0.03318	-0.03024
V57	0.16861	-0.00922
V58	-0.00495	0.18699
V59	0.05585	0.44838
V60	-0.01481	0.72821
OVASS	0.12722	-0.07865
AGE	0.04618	0.07951
SEX	-0.02598	0.09298

Table 10.7 Full varimax rotated factor matrix for group B.

VARIMAX ROTATED FACTOR MATRIX

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5	FACTOR 6	FACTOR 7	FACTOR 8	FACTOR 9	FACTOR 10
V1	0.17121	0.81840	0.13755	0.12256	0.06283	0.07681	0.08945	0.08785	0.17645	0.15398
V3	0.16608	0.20818	0.00286	0.17057	0.29962	0.37938	0.23384	0.17742	0.06024	0.19046
V4	0.08296	0.11223	0.07859	0.94576	0.01552	0.10215	0.07191	0.07478	0.01484	0.18127
V5	0.05544	0.16108	0.72448	0.12128	0.04352	0.12433	-0.01290	0.55296	0.00205	0.03012
V16	-0.12024	0.28429	-0.11362	0.17567	0.06556	-0.10621	0.08681	0.30980	0.15901	0.28226
V17	-0.01369	0.13611	-0.04505	0.32744	-0.04360	-0.08313	0.03278	0.23376	0.05894	0.26794
V18	-0.06492	0.15504	0.02785	0.12568	0.02137	0.05436	0.05858	0.81258	-0.00992	0.04731
V20	0.32377	0.10225	0.11081	0.01983	0.03569	0.59473	0.21709	0.00712	0.14273	0.18213
V21	0.21737	0.06220	0.17677	0.55103	0.07695	0.31548	0.10238	0.04290	-0.00133	0.12547
V22	0.06126	0.09121	0.84692	0.04610	0.03548	0.10181	0.05638	-0.13405	-0.00971	0.02639
V24	0.02311	0.12418	0.10630	-0.01808	-0.12050	-0.09360	-0.11595	0.00918	0.04839	-0.33038
V25	-0.01014	0.13339	-0.03132	0.10554	0.79357	0.03677	0.15874	0.06237	0.05278	-0.08720
V26	-0.04739	0.08904	-0.01586	0.43260	0.09438	-0.05917	0.05212	0.05419	0.01760	-0.14932
V27	0.07352	0.08219	0.59189	0.00626	-0.04510	0.00290	0.06559	0.02772	0.04719	-0.11802
V30	0.05269	-0.03579	0.02143	0.01783	0.78170	0.10399	0.28499	-0.02819	0.07733	0.06756
V34	-0.45779	0.16883	-0.00303	0.06143	0.13548	-0.23273	0.46329	0.26931	0.30842	0.02690
V35	0.55336	0.08511	0.17729	0.13438	0.13711	0.56760	0.09945	-0.02602	0.10009	0.08526
V36	0.11589	-0.03963	-0.09493	-0.06160	-0.02911	-0.15396	-0.04638	-0.07572	-0.00168	-0.06770
V37	0.85375	0.07484	0.09424	0.06824	0.05694	0.22834	0.11260	0.02047	0.25775	0.12103
V38	-0.90857	0.00058	-0.05680	-0.01793	0.00270	-0.09255	-0.07331	0.00306	0.20081	-0.06994
V39	-0.03436	0.17545	-0.06183	-0.17351	-0.08643	-0.24961	-0.59125	-0.19068	-0.00423	0.00851
V40	0.86100	0.06622	0.04715	0.08759	0.06608	0.15722	0.21166	-0.00152	0.24853	-0.01483
V41	-0.91932	-0.04676	-0.00399	0.02128	-0.00218	0.06355	0.04969	0.07890	0.21707	-0.00701
V42	0.21054	0.14985	-0.02557	-0.10035	0.14142	0.10456	0.41759	-0.00816	-0.00343	0.13887
V43	0.07893	-0.02568	0.00191	0.00951	0.04187	0.06776	0.17193	-0.01418	-0.01415	0.08056
V52	0.08463	-0.01907	0.02888	-0.05227	0.00752	0.09276	0.04113	-0.01153	0.08487	0.00694
V53	0.12212	0.16904	0.06064	0.05299	0.26465	-0.01343	0.33053	0.00067	-0.04355	0.05371
V54	0.12492	0.13140	0.05156	0.02658	-0.05282	-0.00992	-0.03767	0.00423	0.03055	0.00937
V55	-0.01209	0.07557	0.03218	0.04610	0.07476	0.00298	0.22700	-0.00847	0.01432	0.02104
V56	-0.02864	0.04111	-0.00856	0.04442	-0.03436	0.03069	-0.01696	0.01704	0.02825	-0.01074
V57	-0.00909	0.85825	0.12428	0.12911	-0.01792	0.01250	-0.04715	0.09287	0.02715	-0.03704
V58	0.04374	-0.18459	-0.01723	-0.05140	-0.09571	-0.15167	0.04437	-0.01376	-0.82357	-0.06333
V59	0.08126	0.33749	0.23181	0.14545	0.23568	0.39123	0.21368	0.17300	0.37256	0.14044
V60	-0.01466	-0.09599	-0.05898	-0.05210	-0.02522	-0.06082	-0.09829	-0.00782	-0.20951	-0.06686
OVASS	0.02171	0.58832	0.08049	0.09059	0.17793	0.12826	0.27152	0.14278	0.02569	-0.10705
SEX	-0.01003	-0.06362	-0.03438	0.03978	0.08461	-0.07143	-0.03307	0.00443	0.00818	-0.37330
AGE	0.15410	-0.05198	-0.06389	0.12506	0.09389	0.05243	0.09503	0.08374	0.09122	0.55979

Table 10.8 Full varimax rotated factor matrix for the whole sample

	FACTOR 11	FACTOR 12
V1	-0.03842	-0.10416
V3	0.00498	0.01283
V4	-0.03139	-0.00598
V5	0.05409	-0.00841
V16	-0.05728	0.03090
V17	-0.04012	0.08412
V18	0.04854	-0.00806
V20	-0.05253	-0.03139
V21	-0.08510	-0.05297
V22	-0.01034	-0.01061
V24	0.27298	0.04075
V25	0.11847	0.03768
V26	0.07432	-0.03847
V27	0.20267	-0.03803
V30	-0.08508	-0.02931
V34	0.00383	0.03216
V35	0.10277	-0.13429
V36	-0.47018	-0.04358
V37	0.13881	-0.04703
V38	0.08232	-0.07367
V39	-0.15668	-0.04726
V40	0.13413	-0.06846
V41	0.03309	-0.04266
V42	-0.18299	-0.01425
V43	-0.07498	-0.01451
V52	-0.11523	-0.04033
V53	-0.03625	-0.09901
V54	0.42094	-0.07119
V55	0.05119	-0.02663
V56	-0.14572	-0.00016
V57	0.08900	0.00474
V58	0.07295	0.26767
V59	0.01784	0.41891
V60	-0.01172	0.55450
OVASS	0.14622	-0.04925
SEX	-0.06940	0.06212
AGE	0.07265	0.03555

Table 10.8 Full varimax rotated factor matrix for the whole sample

10.5 The Factors extracted using Principal Axes with Varimax Rotation

The designation of a loading on a factor as a salient loading implies that the correlation is sufficiently high to assume a relationship exists between the variable and the factor. It also implies that the variable can aid in interpreting the factor, and in turn provide some information about how the variables were used.

Clearly statistical significance alone cannot be used to determine the salience of a loading, because with large samples loadings so small as to be uninterpretable may be statistically significant. In factor analytic studies absolute values of .3 are popular as the minimum loading required for a variable to be adequately interpreted. This can have problems when a variable loads highly on a number of factors, because the meaning of the variable must be split between factors when an interpretation of factors is attempted. This can make it difficult to interpret a factor and can make it necessary for a high loading of a variable to be discarded if it does not aid interpretation. What may be an interpretable salient loading for one variable may not be an interpretable salient loading for another.

In the present study the split group analyses were used as a check of the loadings obtained from the factor analysis of the total group. The initial procedure for interpretation was to pinpoint all loadings of .3 and above for all factors statistically extracted after varimax rotation on the total group. The next stage was to check the loadings for the variable on the equivalent analyses of the split groups. It was only if all three loadings on all the factor analyses were above .3 that a loading was deemed to have passed the first stage of determining whether it was a salient loading.

The second stage was to consider the nature of the variables involved, their respective loadings on the factor, and to attempt to name the factor. This process proved easier than expected, and it turned out that for all the factors interpreted and even for one that was rejected, all the variables were retained because they all contributed to the interpretation of the factors. The extracted factors and their respective loadings of the variables from the three factor analyses are shown in table 10.9.

10.6 Results of the Preliminary Factor Analysis

Tables 10.8 and 10.9 show that the factor analysis on the whole group resulted in seven variables loading at .3 or more on the first factor. Variable 20, 'discusses with subordinates' was rejected for interpretive use on the factor because it did not succeed in achieving a loading of .3 or more for the same factor in both of the factor analyses conducted on the split groups. It has a loading on the factor of .23 in the analysis of group B.

After considering the loadings of the variables left, it seemed appropriate to call the factor 'making decisions' since all the

Factor 1 Making Decisions		Total Group	Split Group A	Split Group B	Retained Loading	Comments
V20	DISCUSSES WITH SUBORDINATES	.32	.46	.23	No	Low loading on Group B causes it to be discarded.
V34	COMMUNICATES BY WRITING	-.46	-.45	-.48	Yes	
V35	COMMUNICATES FACE TO FACE	.55	.61	.55	Yes	
V37	PROCEDURAL DECISION	.85	.90	.82	Yes	
V38	CONCLUDING DECISION	-.91	-.93	-.88	Yes	
V40	TAKES LEADING ACTION	.86	.93	.82	Yes	
V41	TAKES TERMINAL ACTION	-.92	-.94	-.89	Yes	
Factor 2 Amount of Productivity						
V1	ESTIMATED NO. OF WORDS	.82	.84	.78	Yes	
V57	RESPONDS WITH SPECIFICITY	.86	.87	.86	Yes	
V59	NO. OF USUAL COURSES OF ACTION	.34	.38	.28	No	Marginal - Does not conflict with interpretation of factor.
Ovass	OVERALL ASSESSMENT	.59	.60	.56	Yes	
Factor 3 Dealing with Superiors						
V5	NO. OF SUPERIORS INVOLVED	.72	.74	.11 (.70)	Yes	Figures in brackets for B show loadings on factor 6.
V22	DISCUSSES WITH SUPERIORS	.85	.89	.18 (.80)	Yes	
V27	ASKS INFORMATION FROM SUPERIORS	.59	.61	.02 (.52)	Yes	
Factor 4 Dealing with Peers						
V4	NO. OF PEERS INVOLVED	.95	.97	.96	Yes	
V17	COURTESY TO PEERS	.33	.46	.31	Yes	
V21	DISCUSSES WITH PEERS	.55	.60	.53	Yes	
V26	ASKS INFORMATION FROM PEERS	.43	.24	.52	No	Marginal - Does not conflict with interpretation of factor.
Factor 5 Factor Discarded						
V3	NO. OF SUBORDINATES INVOLVED	.30	.25	.26	No	
V25	ASKS INFORMATION FROM SUBORDINATES	.79	.80	.75	Yes	
V30	GIVES DIRECTIONS TO SUBORDINATES	.78	.78	.87	Yes	

All results are corrected to two decimal places.

Table 10.9 Shows results of loadings above .3 for total group using a principal axis factor analysis with varimax rotation and the loadings for similar factors extracted from a similar factor analysis of two random samples of the total group.

variables were scores which related either to actually making a final decision at one end of the scale (the negative loadings) to putting off the decision until later (the positive loadings). Although rejected because of its instability variable 20 also fits this interpretation quite well which gives more confidence that the name given to the factor is appropriate.

The second factor had four variables loading at .3 or more on it in the analysis of the total group. Variable 59, 'no. of usual courses of action' failed to achieve a loading of .3 in the analysis of group B so was rejected for interpretative use on the factor.

The remaining variables of 'estimated no. of words' and 'responds with specificity' strongly suggested that the factor had a strong link with productivity. The overall estimate of how well the role player performed on the in basket test also had a high loading on this factor. This further encourages naming of the factor 'amount of productivity' because it would be expected that productivity would play some part in the assessment of how well a person had done on the in basket test. It is also helpful that despite the inconsistency of variable 59, 'no. of usual courses of action', this variable also has strong associations with productivity, which further raises confidence that the name given to factor 2 is appropriate.

The third factor has three variables loading at .3 or more on it in the analysis of the total group. None of the variables achieved loadings of .3 or above for the third extracted factor in the factor analysis of group B. However factor 6 in the analysis of group B had only three loadings above .3 and they were all the variables in the analysis of the total group and the analysis of group A which had loadings above .3 on factor 3. It seems that in the factor analysis of group B the factor accounted for less of the total variance than in the factor analyses of the other samples. This sort of movement of factors is to be expected because the amount of variance accounted for by factors after factor 2 has been extracted is much less. Consequently, because of sampling error, factors are extracted earlier or later. Details of the amount of variance accounted for by each factor in all the analyses are given in table 10.10 in the case of the analysis of the total group and in Appendix 11 for the split analyses A and B. It can be seen that very little error variance would be required to shift the order in which factors are extracted. For the purposes of the stability study factor 6 in the factor analysis of group B was regarded as equivalent to factor 3 in the factor analyses of the total group and group A.

The above analysis led to the retention of the three variables that loaded on factor 3. Since all the variables concerned superiors the naming of factor 3 was comparatively easy. 'Dealing with superiors' seemed an appropriate name for the factor.

Factor 4 had four variables with loadings above .3 in the factor analysis of the total group. As a result of the factor analyses of groups A and B three of these were retained for the purposes of interpreting the factor. Variable 26, 'asks information from peers' failed to get a loading of .3 on the analysis conducted on group A.

The interpretation of factor 4 again provided little difficulty.

VARIABLE	COMMUNALITY
V1	0.62578
V3	0.45996
V4	0.97566
V5	0.89581
V16	0.36733
V17	0.27644
V18	0.71671
V20	0.58740
V21	0.52956
V22	0.76526
V24	0.25206
V25	0.71605
V26	0.24524
V27	0.42833
V30	0.72736
V34	0.69844
V35	0.76037
V36	0.28780
V37	0.91909
V38	0.90041
V39	0.54848
V40	0.91417
V41	0.91063
V42	0.33587
V43	0.05561
V52	0.04373
V53	0.24534
V54	0.22384
V55	0.07019
V56	0.02940
V57	0.79016
V58	0.83251
V59	0.81393
V60	0.38566
OVASS	0.53942
SEX	0.16839
AGE	0.40200

FACTOR	EIGENVALUE	PCT OF VAR	CUM PCT
1	6.10576	31.1	31.1
2	3.59223	18.3	49.4
3	1.98563	10.1	59.5
4	1.47845	7.5	67.0
5	1.44581	7.4	74.4
6	1.16871	5.9	80.3
7	0.94231	4.8	85.1
8	0.77916	4.0	89.1
9	0.63043	3.2	92.3
10	0.57971	3.0	95.2
11	0.48259	2.5	97.7
12	0.45365	2.3	100.0

Table 10.10 Communality of variables and eigenvalues or characteristic roots of the factors for the whole sample using the Principal Axis Factor Analysis

All the variables concerned related to the style of behaviour adopted by the role player to peers. The factor was therefore called 'dealing with peers'. It is noteworthy that variable 26, despite its inconsistency, is also related to peers which helps to reinforce confidence in the name given to the factor.

Factor 5 had three loadings above .3 in the factor analysis of the total group. Two of these were confirmed in the split group analysis (see table 10.9). The factor, although easy to interpret psychologically (it could be called 'dealing with subordinates'), was rejected as a factor because of the results of the 'scree' test (Cattell, 1966) described below, and the assessment that a conservative factor solution was more likely to be replicable.

10.7 Plotting Characteristic Roots or Eigenvalues

The characteristic root, or eigenvalue as it is sometimes called, is equal to the sum of the squared loadings of variables on a factor when the principal axis factor solution is used. It is therefore a direct index of how much variance is accounted for by each factor. Cattell (1966) has detailed a discussion of a procedure he calls the 'scree' test which uses the characteristic root to determine the number of factors to be extracted. The reason for the name is obvious if figure 10.2 is considered. The first few roots could be seen as a cliff and when the graph flattens out what remains could be viewed as rubble.

The idea behind the test is that a few variables are measuring a limited number of factors well and a larger number of errors or trivial factors not so well. The major factors account for most of the variance and so are large and have bigger characteristic roots. The opposite is true for the error or trivial factors. Larger factors are extracted first and when the smaller factors are extracted plotting them on a graph would result in a straight line sloping downward.

To apply the test a ruler is laid against the bottom half of the graph and where the points deviate significantly from a straight line is the point where trivial factors end and more meaningful factors begin. In the case of figure 10.2 the above procedure leaves four factors, which led to the extraction of four factors for the stability study. Table 10.10 gives the exact values for the characteristic roots used in the graph.

10.8 An Alternative Analysis of the In Basket Scores

The principal axis method of factor extraction is the most popular in the literature (Nie et al, 1974). There are, however, other methods of factor extraction which have implications for the factor structure if there is a wide variation in the communality of variables or if the communalities are generally low.

Table 10.11 shows the communality estimates for the total group used in this study using the principal axis method of factoring. As can be seen there is considerable variability in the communality estimates, as their range extends from .07 to .94. Bearing in mind

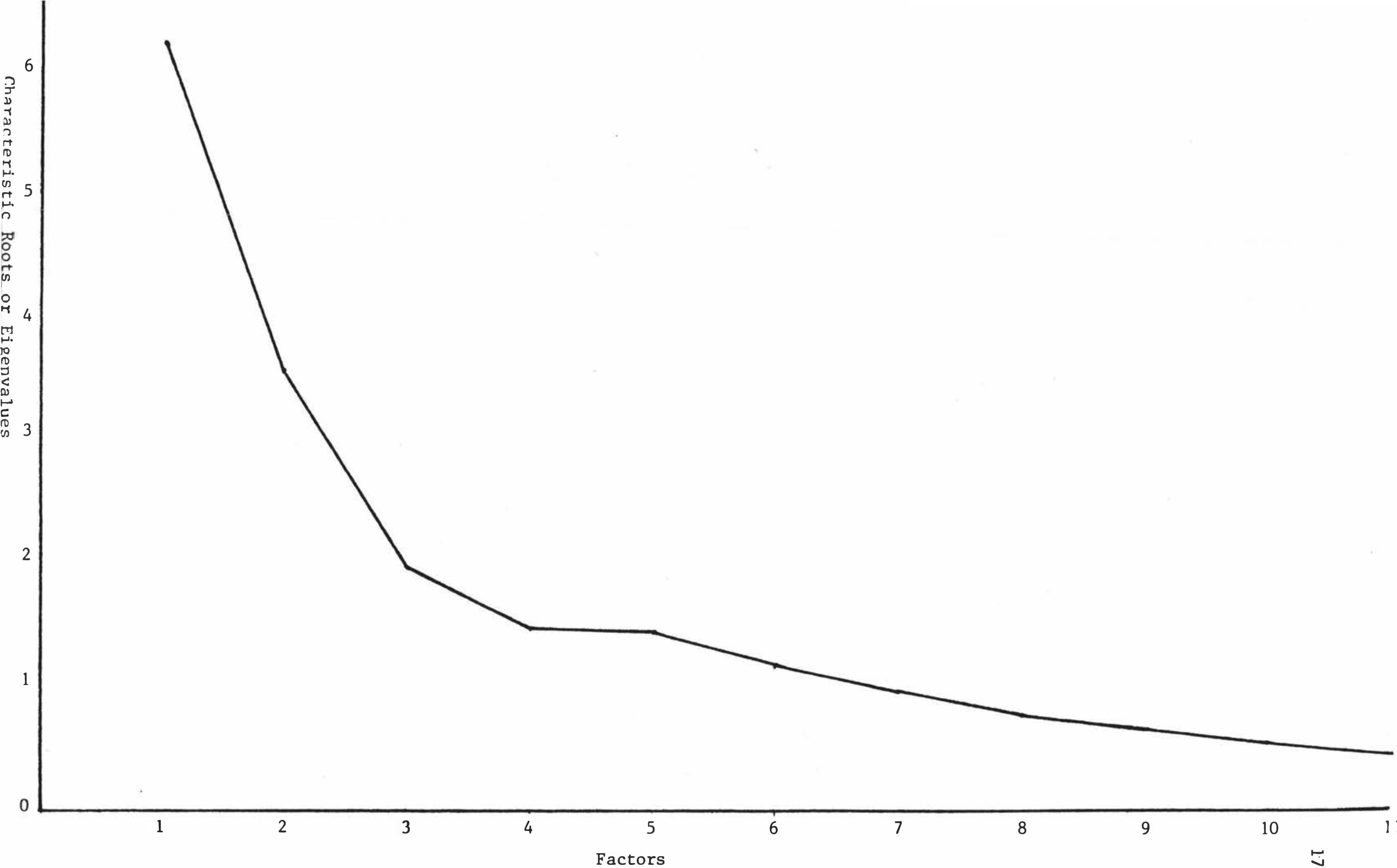


Figure 10.2 Plot of the characteristic roots obtained for the principal axis analysis of the Plasto in basket test.

VARIABLE	EST COMMUNALITY
V1	0.74346
V3	0.45671
V4	0.67931
V5	0.75258
V16	0.38148
V17	0.34560
V18	0.62831
V20	0.53243
V21	0.59451
V22	0.65767
V24	0.20650
V25	0.57386
V26	0.31440
V27	0.37266
V30	0.59988
V34	0.62591
V35	0.73120
V36	0.42548
V37	0.94270
V38	0.93837
V39	0.67584
V40	0.93898
V41	0.93436
V42	0.33819
V43	0.10601
V52	0.12739
V53	0.26292
V54	0.20653
V55	0.15641
V56	0.06871
V57	0.70574
V58	0.78861
V59	0.62782
V60	0.33475
OVASS	0.48980
SEX	0.17027
AGE	0.31441

Table 10.11 Communality estimates for the principal axis analysis

the results of the research on alternative factoring methods it would appear wise to conduct an alternative factoring procedure to confirm the results obtained by using the principal axis method of factor extraction.

Research studies which have compared different extraction procedures have confirmed the conclusion that when communalities are high extraction procedures are almost identical. Tucker, Koopman and Linn (1969), for example, found principal components and principal axes to be the same when the communalities were high for all 20 variables, and Harris and Harris (1971) found most ability factors to appear when several common factor methods were used. It seems from the research that when the number of variables is moderately large, say greater than 30, and the analysis contains no variables expected to have low communalities, say .3 and below, most of the exploratory procedures lead to the same interpretations.

10.9 Principal Axis and Image Factor Analysis

Principal axis factor analysis involves extracting the principal factors from a matrix with communality estimates in the diagonal. The way the communalities are estimated is the main difference between the various principal factor solutions to correlation matrices. The principal axis method used for the analysis in this study uses the squared multiple correlation between a given variable and the rest of the matrix. An iteration procedure is also employed so that the estimates of communality can be improved. The number of factors are initially determined, and then multiple correlation estimates of communality are put in the diagonal of the correlation matrix. The same number of factors are extracted from this reduced matrix, and the variance accounted for by these factors become new communality estimates. The diagonal of the correlation matrix is then replaced by these new estimates of the communality. The iteration sequence automaticallly stops if any estimated communality exceeds one. The factors for the previous iteration are then retained. For the analysis of the total group in this research one or more variables had a communality estimate greater than 1.0 so the factors after iteration 5 were the ones used as the factor solution.

Image analysis postulated by Kaiser (1963) differs from the principal axis solution primarily in the iteration of the correlation matrix before factors are extracted.

Instead of finding the principal factors of a correlation matrix, image analysis finds the principal factors from a variance - covariance matrix of the images of the variables.

The image of a variable is that part of it that can be estimated by other variables in the same area. The estimation is carried out through the use of multiple regression; each variable is predicted from the others using the beta weights available through multiple regression. Image factor analysis uses every variable's image and since this only includes variance which other variables already have, no variance unique to any one variable is used in this method.

As the number of variables included in the factor analysis become more representative of the total variance in a particular area so the image factor analysis solution should be more similar to the principal axis solution. This makes sense because if an extremely large number of variables were available all variables would be represented almost exactly by another variable. The number of variables necessary to achieve this however is usually very large and is rarely attained in psychological studies.

An image analysis using this alternative procedure of estimating communalities was carried out on the total group of people who did the in basket test, to check the stability of factors using an alternative factoring procedure.

10.10 The Results of the Image Analysis

The anti image covariance matrix, image covariance matrix, pre-rotated image factor matrix are shown in Appendix 12. The full varimax rotated image factor matrix is shown in table 10.12. Table 10.13 shows the loadings obtained for all the extracted and interpreted factors for the principal axis factor analysis after varimax rotation and the equivalent loadings using image analysis in the same way. The results for the first two factors in table 10.13 are for the same factors in their order of extraction for both analyses. Factors 3 and 4 in the principal axis analysis are however compared to factors 4 and 5 in the image analysis. This is because factor 3 in the image analysis represents factor 5 in the principal axis analysis. This has occurred because in the image analysis, after factor 2 , the factors are accounting for different proportions of variance, which has changed their order of extraction

VARIMAX ROTATED FACTOR MATRIX

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5	FACTOR 6	FACTOR 7	FACTOR 8	FACTOR 9	FACTOR 10
V1	0.18239	0.72427	0.10051	0.14817	0.14709	0.16669	0.10590	-0.07088	0.12882	0.12258
V3	0.21517	0.21685	0.34230	0.05343	0.20172	0.10586	0.16086	0.14646	0.15901	0.01922
V4	0.09725	0.13052	0.05986	0.08424	0.72731	0.03416	0.10901	0.05787	0.11281	0.03396
V5	0.05371	0.18290	0.04611	0.65378	0.15120	0.01237	0.42519	0.05761	0.04951	0.00540
V16	-0.10975	0.27541	0.08015	-0.10390	0.17407	0.13138	0.29998	-0.00342	0.15990	0.04011
V17	-0.01991	0.12713	-0.03221	-0.05073	0.33776	0.04606	0.24710	-0.02075	0.16825	-0.04340
V18	-0.06896	0.17084	0.04578	0.08925	0.14206	-0.00092	0.67102	0.10122	0.04401	-0.00403
V20	0.37605	0.11518	0.13155	0.14265	0.08816	0.19033	0.00718	0.16526	0.21236	0.04235
V21	0.23512	0.07521	0.11269	0.17710	0.57380	0.02582	0.03417	0.08622	0.11228	0.05432
V22	0.07757	0.08987	0.03539	0.73474	0.06279	0.00617	-0.08635	-0.01442	0.02710	0.02157
V24	0.00459	0.11764	-0.11828	0.11771	-0.06858	0.00962	-0.01634	0.03869	-0.19585	-0.01567
V25	-0.00113	0.14842	0.67390	-0.00982	0.08756	0.04247	0.04924	0.06666	-0.07175	0.00482
V26	-0.05028	0.09486	0.08939	-0.00050	0.38333	0.01058	0.03921	0.05501	-0.13120	0.04875
V27	0.07389	0.08778	-0.01841	0.54588	-0.00330	0.02231	0.01812	0.06611	-0.05198	0.04912
V30	0.06805	-0.00462	0.69006	0.01376	0.03317	0.06413	-0.01663	0.08693	0.03004	0.04646
V34	-0.44529	0.21713	0.22873	-0.02071	0.04432	0.17654	0.24654	0.23121	0.00837	0.09196
V35	0.58931	0.09150	0.17217	0.21662	0.16654	0.19455	-0.03570	0.14281	0.13174	0.10084
V36	0.08920	-0.07621	-0.04957	-0.12503	-0.08022	-0.05269	-0.04996	-0.19694	-0.07808	0.01065
V37	0.86538	0.09028	0.10326	0.10415	0.08712	0.20528	0.01725	0.09178	0.11663	0.09914
V38	-0.90056	0.00864	-0.02008	-0.05689	-0.03371	0.21269	0.00744	0.01105	-0.07425	0.08246
V39	-0.08019	0.06858	-0.23233	-0.09624	-0.15458	0.01219	-0.12122	-0.65427	-0.06296	-0.03105
V40	0.87269	0.10448	0.11349	0.06640	0.08905	0.19906	-0.01773	0.14536	0.00453	0.12447
V41	-0.89615	-0.02336	0.03570	0.00014	0.00568	0.21543	0.06691	0.14367	0.03437	0.07257
V42	0.23166	0.16828	0.19237	-0.01804	-0.06138	0.03419	0.01513	0.10846	0.09570	0.02669
V43	0.06880	-0.02339	0.05667	0.00050	0.03129	0.01252	0.00327	0.02800	0.03513	0.00145
V52	0.07484	0.00341	0.02408	0.01603	-0.02875	0.03355	-0.01157	0.01070	0.01917	0.03746
V53	0.10390	0.15808	0.28679	0.05094	0.06692	-0.02826	0.02453	0.02894	0.00537	0.06756
V54	0.12155	0.09473	-0.04006	0.06147	0.01539	0.02244	0.02496	-0.01940	0.02280	0.03175
V55	-0.01020	0.05722	0.12181	0.02733	0.04042	0.01008	0.01280	0.05654	0.03372	0.02224
V56	-0.02572	0.02873	-0.01490	-0.00794	0.03253	0.01163	0.00738	0.00971	0.02270	0.00348
V57	-0.00785	0.75635	0.00425	0.14390	0.12380	0.02309	0.09313	-0.09019	0.02751	0.02748
V58	0.03391	-0.17331	-0.10107	-0.01723	-0.05806	-0.74276	-0.02734	0.02660	-0.04753	-0.33889
V59	0.12875	0.33825	0.30297	0.25050	0.18416	0.34446	0.17505	0.16659	0.14553	-0.11606
V60	-0.02974	-0.09135	-0.04492	-0.05344	-0.05416	-0.15151	0.00185	-0.02150	-0.05986	-0.45586
OVASS	0.04161	0.56967	0.22808	0.12310	0.09444	0.02931	0.12365	0.12155	-0.03485	0.06671
SEX	-0.02493	-0.05866	0.04425	-0.02487	-0.00459	-0.00038	-0.01789	-0.01350	-0.31781	-0.03772
AGE	0.16463	-0.02668	0.11502	-0.06758	0.17718	0.09995	0.10122	0.07103	0.34686	0.00019

Table 10.12 Full varimax rotated Image Factor matrix for the whole sample

	FACTOR 11	FACTOR 12	FACTOR 13	FACTOR 14	FACTOR 15	FACTOR 16	FACTOR 17	FACTOR 18	FACTOR 19	FACTOR 20
V1	0.01140	0.01942	0.03694	0.02504	0.07548	0.06679	-0.00499	-0.02361	0.01807	-0.00772
V3	0.18673	0.15459	-0.05748	0.00109	0.00257	0.04140	0.09498	0.00963	0.01401	0.05919
V4	0.02303	0.04699	-0.00727	-0.01346	0.03899	0.03690	0.01146	0.02748	0.00523	0.01274
V5	0.04746	0.00107	0.05208	0.03689	-0.00767	-0.02165	-0.01370	0.00327	-0.01538	-0.01756
V16	-0.11438	0.03351	-0.07685	-0.08913	0.05105	0.02019	0.08717	-0.00855	0.11477	0.01372
V17	-0.06523	0.00670	-0.03392	-0.02733	0.00168	0.09826	-0.06432	0.03096	0.14216	-0.01277
V18	0.01765	0.00737	0.04978	-0.01448	-0.00203	0.00648	0.00294	-0.00664	-0.03169	0.00091
V20	0.30129	0.17113	-0.02498	0.17940	0.03594	0.08986	0.06484	0.05984	0.00047	0.01003
V21	0.12449	0.12639	-0.01947	0.09833	0.06500	-0.02448	0.02609	0.12091	-0.05140	-0.01604
V22	0.04950	0.04347	-0.03449	0.01378	-0.01360	0.01686	0.01297	0.00100	0.00353	0.01043
V24	-0.03511	-0.15030	0.23727	-0.04147	-0.02224	-0.02943	-0.04861	-0.00406	0.00011	-0.03557
V25	-0.00859	0.01408	0.00652	-0.00544	-0.05983	0.03694	-0.01651	-0.01254	-0.01602	0.02203
V26	-0.03671	-0.03526	0.05590	-0.12544	0.01689	0.02490	0.01863	-0.14002	-0.02360	0.00420
V27	-0.02684	-0.03396	0.13631	0.01065	-0.04507	0.03894	0.00803	0.00004	-0.00480	-0.00209
V30	0.02108	0.11081	-0.10199	0.06999	0.00066	0.08697	0.00859	0.01709	0.02492	-0.03617
V34	-0.29479	0.02405	-0.05069	0.04875	0.00343	0.14133	0.03240	0.02856	0.03009	0.01622
V35	0.33422	0.13418	0.08437	0.07613	-0.01295	0.02097	0.02731	-0.02288	-0.02414	-0.02338
V36	-0.06952	0.08379	-0.21874	0.01607	0.32282	0.06676	-0.22448	0.00597	0.01271	0.00188
V37	0.02461	0.08073	0.12490	0.14117	-0.02828	0.00441	0.02846	0.05957	0.05283	-0.10453
V38	-0.00654	-0.10279	-0.00874	-0.07942	-0.05546	-0.00369	0.03290	-0.07722	-0.05630	0.10416
V39	-0.01959	-0.11502	0.01362	-0.03273	0.00630	-0.11757	-0.01111	0.00427	0.00178	0.00120
V40	-0.03376	0.06634	0.06411	0.06975	-0.08643	0.02244	0.00586	-0.06103	-0.04880	0.10973
V41	0.05967	-0.04045	0.01454	0.00153	0.05291	0.01801	0.03225	0.05020	0.04754	-0.11003
V42	-0.00186	0.26525	-0.20055	-0.00643	-0.02017	0.12275	0.03978	-0.02616	-0.03310	-0.00003
V43	0.01446	0.23100	-0.03324	0.04322	-0.02117	0.03466	-0.01077	0.00651	0.00557	-0.00202
V52	0.00681	0.03914	-0.02183	0.25089	0.04895	-0.01379	-0.00078	0.00142	-0.00109	-0.00013
V53	-0.03874	0.22756	-0.01015	0.00643	-0.02291	0.13928	0.02228	-0.03257	-0.02259	0.01125
V54	0.01127	-0.03787	0.32323	-0.03074	-0.10169	0.07310	0.02005	-0.00317	-0.00472	0.01000
V55	0.00348	0.07860	0.04290	-0.02053	0.01493	0.26216	-0.00539	0.00007	0.00296	0.00000
V56	0.00684	-0.02336	-0.02470	0.03147	0.19960	0.00074	0.00959	-0.00036	-0.00084	-0.00034
V57	0.00504	-0.06920	0.12127	-0.01027	0.06165	0.00726	-0.01110	0.01810	0.02253	-0.03856
V58	-0.01591	-0.02165	-0.05004	-0.09872	-0.02978	-0.00922	-0.00097	0.00808	-0.00380	0.00217
V59	0.09450	0.09008	-0.00302	0.10000	0.01163	0.06795	0.06808	0.05427	0.01374	0.01610
V60	-0.00390	-0.01703	-0.02037	-0.06274	-0.00953	-0.02961	-0.00020	0.00151	0.00153	-0.00043
OVASS	0.01733	0.04623	0.08333	0.01223	-0.04541	0.07658	0.02044	-0.00882	-0.05301	0.05091
SEX	-0.02397	-0.02073	-0.00950	-0.00345	-0.03244	-0.02714	0.01167	-0.01243	0.01469	0.00362
AGE	-0.04281	0.07300	-0.03053	0.07177	-0.03938	-0.01857	0.05747	-0.04023	0.06752	0.00055

Table 10.12 Full varimax rotated Image Factor matrix for the whole sample

	FACTOR 21	FACTOR 22
V1	-0.02003	0.00005
V3	0.08325	0.00031
V4	0.00882	0.00001
V5	0.00639	-0.00020
V16	0.00887	0.00031
V17	0.01306	-0.00010
V18	-0.00676	-0.00003
V20	0.06916	0.00014
V21	0.00218	0.00003
V22	0.01188	-0.00012
V24	-0.01560	0.00023
V25	0.01543	-0.00004
V26	-0.01544	0.00000
V27	-0.01366	0.00019
V30	0.00044	-0.00003
V34	0.06019	0.00024
V35	-0.04672	-0.00009
V36	0.00337	0.00002
V37	0.01458	-0.00001
V38	-0.03373	-0.00001
V39	0.00322	0.00001
V40	-0.02182	0.00003
V41	0.00644	-0.00003
V42	-0.02847	0.00005
V43	0.00861	-0.00000
V52	-0.00038	-0.00000
V53	-0.09668	0.00007
V54	0.00257	-0.00007
V55	0.00164	-0.00000
V56	0.00012	-0.00000
V57	-0.00472	0.00005
V58	0.00912	0.00002
V59	0.08383	0.00009
V60	0.00072	-0.00000
OVASS	0.01696	-0.00016
SEX	-0.01095	-0.00003
AGE	-0.05057	-0.00005

Table 10.12 Full varimax rotated Image Factor matrix for the whole sample

Factor 1 Making Decisions	Principal Axis Loadings	Image Factoring Loadings	Comments
V20 DISCUSSES WITH SUBORDINATES	.32	.38	
V34 COMMUNICATES BY WRITING	-.46	-.45	
V35 COMMUNICATES FACE TO FACE	.55	.59	
V37 PROCEDURAL DECISION	.85	.87	
V38 CONCLUDING DECISION	-.91	-.90	
V40 TAKES LEADING ACTION	.86	.87	
V41 TAKES TERMINAL ACTION	-.92	-.90	
Factor 2 Amount of Production			
V1 ESTIMATED NUMBER OF WORDS	.82	.72	
V57 RESPONDS WITH SPECIFICITY	.86	.76	
V59 NO. OF USUAL COURSES OF ACTION	.34	.34	Omitted - Because of low split Group B Loading
Ovass OVERALL ASSESSMENT	.59	.57	
Factor 3 Dealing with Superiors			
V5 NO. OF SUPERIORS INVOLVED	.72	.65	
V22 DISCUSSES WITH SUPERIORS	.85	.74	
V27 ASKS INFORMATION FROM SUPERIORS	.59	.55	
Factor 4 Dealing with Peers			
V4 NO. OF PEERS INVOLVED	.95	.73	
V17 COURTESY TO PEERS	.33	.34	
V21 DISCUSSES WITH PEERS	.55	.57	
V26 ASKS INFORMATION FROM PEERS	.43	.38	

All results have been corrected to two decimal places

Table 10.13 Shows results of loadings above .3 using a Principal Axis and Image Factor analysis on the total available subjects. The loadings have been rotated using a Varimax rotation for the respective analyses. An inspection of tables 10.8 and 10.12 shows that factor 5 is more representative of factor 3 in the image analysis (loadings above .3). Since through the scree test and the exploratory nature of the research a conservative solution was adopted, the results for factor 5 on the principal axis analysis are not reported in table 10.13. Consequently factor 3 from the image analysis is omitted from the table and does not form part of the comparison of the effects of the two different forms of analysis on the data.

The results in fact show very little difference between the loadings using the two different types of analysis for the extracted factors, the largest difference being .22 for variable 4's loading on factor 4, (Dealing with peers).

The image factor analysis therefore further confirms the extracted factors and their loadings obtained from the principal axis solution.

10.11 A Comparison of the Analysis with Earlier Studies

Given that there is some justification for confidence in the loadings obtained using the principal axis factoring method it is now appropriate to compare the results with earlier studies, particularly that of Meyer (1970).

The reported loadings for the factor analysis conducted by Frederiksen (1962) and Frederiksen, Jensen and Beaton (1972) are not excluded because although Meyer accepted more reasonable reliability coefficients for the inclusion of variables in his factor analysis, as he pointed out: "In carrying out this factor analysis it was recognised that for the number of variables involved (27) the size of the sample (81) is much smaller than would be considered acceptable or at least desirable for factor analysis by most statisticians." Although there were problems with the accepted reliability of variables for their inclusion in the factor analysis in the other studies, none suffered from problems of the sample size being too small for the number of variables factored. Frederiksen (1962) used 335 subjects and 40 variables in his study, and Frederiksen et al (1972) used 260 subjects and 50 variables in their study.

Table 10.14 shows the factors extracted and the variable loadings using the principal axis method with varimax rotation. Closely approximating factors from the other three studies are also included for comparative purposes. Any comparison of factors must be confusing because of the different factoring techniques used in each case. It is significant that on no occasion, apart from Frederiksen et al (1972), is a case presented for the particular factoring method adopted. The issue is further confused by the low reliability coefficients for both the studies by Frederiksen and his colleagues and the failure to report all loadings on all the extracted factors in Meyer's study.

It would nevertheless appear from the results that there is a factor common to all the studies that is involved with scoring categories related to the making of decisions. It is gratifying to see some

FACTOR 1	PRESENT STUDY	FREDERIKSEN 1962	FREDERIKSEN, JENSEN & BEATON 1972	MEYER 1970	COMMENTS
V34 COMMUNICATES BY WRITING	-.46	.61	.84	.52	
V35 COMMUNICATES FACE TO FACE	.55	.08	.69	.91	
V37 PROCEDURAL DECISION	.85	.10	.81	.90	
V38 CONCLUDING DECISION	-.91	.58	.44	LOADS ON MEYER - FACTOR 2	
V40 TAKES LEADING ACTION	.86	.22	.88	.85	
V41 TAKES TERMINAL ACTION	-.92	.56	.29	LOADS ON MEYER - FACTOR 2	
Factor 2					
V1 ESTIMATED NUMBER OF WORDS	.82	.21	.22	.40	
V57 RESPONDS WITH SPECIFICITY	.86	NOT USED IN ANALYSIS	-.07	NO REPORTED LOADING ON ANY FACTOR	
OVASS OVERALL ASSESSMENT	.59	NOT USED IN ANALYSIS	NOT INCLUDED IN ANALYSIS	NOT INCLUDED IN ANALYSIS	
Factor 3					
V5 NO. OF SUPERIORS INVOLVED	.72	.07 (.49)[1]	.78	NO REPORTED LOADING ON ANY FACTOR	[1] Figures in brackets represent loading on Factor 5 in this study.
V22 DISCUSSES WITH SUPERIORS	.85	.30 (.23)	.45	NO REPORTED LOADING ON ANY FACTOR	
V27 ASKS INFORMATION FROM SUPERIORS	.59	NOT USED IN ANALYSIS	.30	NO REPORTED LOADING ON ANY FACTOR	
Factor 4					
V4 NO. OF PEERS INVOLVED	.95	NOT USED IN ANALYSIS	-.20 (.60)[2]	NO REPORTED LOADING ON ANY FACTOR	[2] Figures in brackets represent loading on Factor 7 in this study.
V17 COURTESY TO PEERS	.33	NOT USED IN ANALYSIS	.11 (.63)	NO REPORTED LOADING ON ANY FACTOR	
V21 DISCUSSES WITH PEERS	.55	NOT USED IN ANALYSIS	.25 (.37)	NO REPORTED LOADING ON ANY FACTOR	
METHOD OF FACTOR ANALYSIS USED	PRINCIPAL AXIS WITH VARIMAX ROTATION	PRINCIPAL COMPONENTS WITH LARGEST CORRELATION WITH VARIABLES IN MATRIX USED AS COMMUNALITY ESTIMATE OBLIMIN ROTATION	WITHIN GROUP COVARIANCE FACTOR ANALYSIS (A PRINCIPAL COMPONENTS METHOD) OBLIQUE ROTATION WAS USED	CENTROID FACTOR ANALYSIS WITH OBLIMIN SOLUTION	

Table 10.14 A comparison of loadings from three earlier studies with the results of the loadings obtained for factors on the Plasto In Basket Test

measure of agreement in some of the variables used by Meyer for this particular factor, notably variables 35,37 and 40 and the present research. Unfortunately the picture is spoilt somewhat by the poor correspondence between variables 38 and 41 for the two studies. Frederiksen, Jensen and Beaton (1972) obtained high loadings for variables 34,35, 37, 38, and 40 for the first factor, but failed to get the negative loadings obtained in the present study. The earlier study by Frederiksen (1962) does not agree with loadings obtained for the first factor in the present study in any way. The only loadings above .3 are positive correlations for variables 34,38, and 41 when the present study obtained negative loadings for these variables.

A perusal of the rest of table 10.14 shows little correspondence between factors extracted in earlier research and factors obtained in the present study. An exception could be the loadings for factor 3 obtained by Frederiksen, Jensen and Beaton (1972). Their loadings all reach the critical level of .3 for this factor which suggests that it could be the same as factor 3 in the present study. However, this could be a chance result, and for there to be any confidence that factor 3, 'dealing with superiors' is a factor found in the analysis of all in basket tests there should be some support from the other two studies. This unfortunately does not occur. It is also important to appreciate that in the quoted comparison studies in table 10.14 other variables also loaded on the extracted factors in the other studies which did not load on the factors in this study.

10.12 An Explanation for the Factor Analysis Results

The four factor analyses extracted four reasonably stable factors from the data. This solution can be viewed as conservative and arguments can be made for the extraction of further factors. The real issue, however, is the lack of agreement of factors from study to study, for if agreement between studies about the factors which account for the major variance cannot be reached, an argument concerning the extraction of later factors accounting for smaller amounts of variance becomes irrelevant.

An explanation for the lack of agreement could be the nature of the situations which form the background to the in basket tests. In comparing the results of factor analyses from study to study an assumption is made that the situations which are the core of the in basket test cause similar patterns of scoring between the scoring categories. It is now important to consider whether this is a valid assumption.

Research on leadership has moved away from a concentration on traits because of studies such as Stogdill (1948) and Porter (1962) who could not find any support for the approach, to more of an emphasis on the interdependency of traits and situations. Based on data he has gathered over the years Fiedler (1967) constructed the contingency model part of which states: "The effectiveness of a group is contingent upon the relationship between leadership style and the degree to which the group situation enables the leader to exert influence." Further hypotheses related to this one describe the relationship between a derived score from a semantic differential called The Least Preferred Coworker (LPC) and situation favourability. Despite the fact that support for Fiedler's precise model is equivocal, with Evans and Derner (1974), Green and Nebeker (1977), and Saskin Taylor and Tripathi (1974) finding problems with the specific hypotheses and Schnier (1978) providing some support for his approach the importance of the particular situation in concert with the traits the manager possesses is of undeniable importance for the emergence of effective leadership and good management performance. If situations are an important variable for the emergence of leadership, rather than expecting factor analytic studies of the in basket test to display consistency from study to study the reverse should occur. In this respect the situation is analogous to motor work sample tests where evidence is available that because of the independent nature of motor skills (Fleishman 1962), different motor work sample tests do not have the independent motor skills in the same proportions and they relate to one another in quite a different way from test to test (Smith and Downs 1975). Similarly, if the scoring categories in the in basket test are regarded as the independent motor skills, they too would interrelate very differently from test to test. The early attempts at comparing factors, and the results of this study would tend to confirm this. Operationally different inter-relationships between categories could occur because of differences in the climate of organisations. In organisations where discussion of problems is encouraged and problems are resolved through openness and joint consultation, the scoring category of 'discusses with peers' may be invariably linked to 'refers to peers'. On the other hand, in an organisation where the reverse is the case, and where little formal discussion with peers occurs, little relationship between 'discusses with peers' and 'refers to peers' would be found. Under these circumstances factor analysis can only be of value if precise detail of the interrelationships of scoring categories for a particular situation is required. This might be of interest to applied psychology, but not to practical psychology. Another reason for the poor correspondence between factors from study to study are the poor reliabilities of scoring categories in some studies. This causes some doubts about the value of conducting factor analyses, especially without the reliability checks recommended by Gorsuch (1974), if the basic variables used in the analysis lack good reliability.

One of the reasons given for conducting the factor analyses was to provide some basis for the entry of variables in the multivariate discriminant analyses anticipated for hypothesis one to be tested. The results were not used for this purpose because the factors extracted from the various studies including the present one lack inter study stability. It was decided that it would be wiser to test the individual merits of each scoring category in the multivariate analyses conducted. The use of a forced entry backward stepwise selection procedure described in Chapter 11 helped to reduce the probability of the inclusion of redundant variables in the multivariate discriminant functions.

10.13 Summary

Following the algorithm designed by Gorsuch (1974), four separate factor analyses were conducted on the total group data. The first three used a principal axis solution with varimax rotation. Two separate samples of the complete sample were randomly assigned to two separate factor analyses. The results obtained were used to decide whether loadings obtained on extracted factors were salient. An image analysis using varimax rotation was also conducted on the total sample to ascertain the effects of a different form of factor analysis on the factors and the variables which loaded on them. Despite good consistency between the methods the results obtained using the principal axis factor analysis with varimax rotation on the total sample did not compare well with factor analyses conducted in earlier research on the in basket test. For this reason the results were not used as a method for inserting variables in the discriminant analyses described in the next chapter. It was also suggested that the results could be explained by the different nature of situations where the scoring categories could be expected to relate to one another in different ways depending on the climate of the organisation which forms the basis of the situation used in the in basket test.

CHAPTER 11

PREDICTING PERFORMANCE USING THE IN BASKET TEST

11.1 Introduction to the Validity Studies

Hypotheses one and two as outlined in chapter seven are:

(1) A single variable of overall assessment of performance on the in basket test would be at least as good as a multivariate method of scoring the test for predicting performance over a number of separate samples.

(2) The single variable of overall assessment of performance on the in basket test is a valid method of marking in basket tests over a number of samples.

A previous discussion of the nature of personnel decisions has provided some justification for the use of discriminant analysis as a method of evaluation ideal for the decision making peculiar to selection for work. It is now appropriate to consider the approach adopted to testing hypotheses one and two and how the analysis was conducted. This chapter also contains a discussion of the results in relation to the testing of these hypotheses.

11.2 The Basis of Discriminant Analysis

Discriminant analysis is used to distinguish statistically between two or more groups. In the case of the present research two criteria were used: success at a final examination and the ability to hand in assignments on time. Subjects' scores on each criterion were divided into two, in the manner described in Chapter seven. For this research two groups were used in each criterion, and the objective was to weight, and combine linearly the discriminating variables chosen as acceptable for inclusion in the analysis, in a way that the two groups in each criterion were as statistically distinct as possible. The research also included a separate discriminant analysis using the one variable of an overall assessment by the scorer of a person's performance on the in basket. This was done with the aim of assessing whether the multivariate approach, with its possibly superior discriminating ability, was significantly superior over a number of separate samples to the simple measure of overall assessment.

Once discriminant functions have been derived it is possible to consider two aspects of research, analysis and classification. Analysis involves statistically testing the success the variables have in discriminating between the groups when combined into discriminant functions. Classification involves the derivation of classification functions which use the cases with known group memberships to construct the function. The function can then be used to classify unknown cases. From the point of view of the practitioner this is extremely useful, because discriminant analysis provides a probability of a person being in a particular group, based on discriminant functions derived from the patterns available from past results. A problem with the approach is the generalisability of any one discriminant function obtained from one set of data to another. This makes it important to establish that any discriminant function and its associated loadings for variables is not a product of the vagaries of the particular sample used. The situation is not dissimilar to the questions posed earlier about the reliability of scoring categories, and the stability of loadings on factors in factor analysis.

After the reliability analysis thirty five scoring categories, together with the variables of age and sex, were available for use in the discriminant analyses, making thirty seven in all. It is unlikely that all of these variables are necessary to achieve satisfactory discrimination between the groups in the criteria. To reduce the variables a stepwise procedure can help to select the most useful variables for inclusion in the discriminant function. This procedure starts by choosing the single best discriminating variable, according to a predetermined criterion, which can be based on a number of different statistics.

A second variable is chosen on the basis that it will improve the discriminatory ability of the function after taking account of the first. Further variables are chosen in the same way so that they make significant contributions to the way the groups are separated. At each step some variables already included in the analysis can be removed if they no longer contribute anything significantly unique to the separation of the groups. At the end of the stepwise procedure some variables will have been selected for inclusion in the function, and others will not. At the end of this process only variables selected play any further part in the analysis.

11.3 The Stepwise Selection Process and the Stepwise Criteria

Stepwise selection begins by picking the variable which has the highest value on the particular selection criterion used. The first variable is then compared individually to all the other variables entered and the selection criterion is calculated. The variable which produces the best criterion value is used as the next to enter the discriminant function. The process is then one of repetition where the two variables selected are compared to the rest of the variables and the best combination causes a third variable to be chosen. This continues until all the variables have been selected, or none of the remaining variables provide a minimum previously set level of improvement in the discriminatory power of the discriminant function.

During the process of variable selection variables earlier included in the function can lose their discriminatory power. This happens because the information they provide about the differences between the groups is now available through some combination of other variables already in the discriminant function. It is for this reason that at the beginning of each step, previously selected variables are tested to see if they still contribute to the discrimination between the groups. Removed variables can re-enter the discriminant function if they satisfy the criterion at that step. A pilot study was conducted to test three stepwise criteria to ascertain if a different statistic would affect the order variables were stepped into the analyses. The three criteria tested were Wilks (Nie et al 1974), Mahal (Overall and Klett 1972) and Rao's V (Overall and Klett 1972). No differences were found between the criteria and as a result Wilks lambda was used for the rest of the research because it is more sparing of computer time.

Before the stepwise method is used to test a variable for inclusion into the function, a variable is considered for selection only if its partial multivariate F ratio is larger than 1.0. This is set deliberately low, but is included to ensure that a variable considered at a particular step does have some significant added variance that can contribute to the centroid separation of the groups. It is set low so that all variables that have something unique to contribute to separation are retained for the analysis, and further tested using the stepwise criterion statistic chosen.

11.4 The Discriminant Functions Calculated on the Variable Success

In the analyses to be described in this chapter the criterion success, with the exception of analysis 8, was used. Analysis 8 is described in full later. The criterion success was divided into two parts as described earlier: those who passed and those who failed the course in Industrial and Organisational Psychology. The purpose of the discriminant analyses was to separate the passes and failures on the course as much as possible and compare the results of the combination of variables to the single variable of overall assessment over a number of independent samples.

The study used the three sets of student data, the 1977 and 1978 extramural students and the 1978 internal students. The procedure used was to perform a discriminant analysis on the first student sample obtained, the 1977 extramural students (Analysis 1), and to compare the discriminant function calculated for this sample to the discriminant function obtained for the 1978 extramural student sample using the variables that appeared in the discriminant function calculated in Analysis 1. This was Analysis 2. The variables which were used in the 1977 extramural discriminant function were also used, to test their efficacy for discriminating between success and failure on the course in Industrial and Organisational Psychology for the 1978 internal student sample. This was Analysis 3. The functions calculated were based on all available variables using a forced entry backward stepwise selection procedure.

Forced entry backward stepwise selection allows all the variables to be considered more than once for inclusion or removal from the discriminant function. Hull and Nie (1981) consider the procedure of backward stepwise selection very useful when a large number of variables contribute significantly to discrimination. Backward stepwise selection will remove variables from the discriminant analysis which no longer contribute significantly unique variance to the function. This often can leave a simpler function with fewer variables in it, without a loss of discriminatory power.

In Forced Entry Backward Stepwise selection all variables are first of all forced into the function without regard to the criterion statistics used. Backward selection involves the retention of only those variables that provide significant unique discrimination according to the criterion statistic used, in the case of this research Wilks lambda. Variables that do not achieve the required level of significance are removed from the equation. Summary tables of results should show clearly all the action taken for any separate analysis including the values of the criterion statistic and its significance.

To test the hypothesis that the single variable of overall performance on the in basket test would be at least as good as a multivariate method of scoring the test over a number of samples it was important to test the stability of any derived multivariate function to ensure that it provided stable results from sample to sample. This would allow a comparison to be made between the results obtained with the multivariate discriminant analyses to those using a single variable in the discriminant analyses.

In the normal course of research, this sort of check is often not conducted because of limitations of time and facilities. As with the possibility of extracting factors in a factor analysis of random data, and obtaining significant correlations from correlational techniques, if one uses enough variables and adopts a shotgun approach, so too, given a large enough number of variables, it is possible to obtain a large amount of discrimination by chance. This cannot be adequately tested if only one or two samples are used to derive a discriminant function. Discriminant analyses were also conducted on all three samples using the single variable of overall assessment of performance on the in basket test (Analyses 4 5 and 6). After this was completed it would be possible to compare the results of the two sets of analyses, those using multivariate data and those using the single variable of overall assessment of performance on the in basket test, and evaluate the truth or falsity of hypothesis one. Analyses 4,5,and 6 also provide some data that can be used to test the hypothesis concerning the validity of the single variable of overall assessment as a means of scoring the in basket test over a number of samples. A discriminant analysis was also conducted for the whole group using the single variable of overall assessment on the in basket test (Analysis 8). This was conducted to see the effectiveness of the single variable of overall assessment for discriminating between the successes and failures for the total sample of 1977 and 1978 extramural and 1978 internal students, as a further test of hypothesis 2. Analyses 4 5 6 and 7 were also conducted to test hypothesis two namely that the single variable of overall assessment of performance on the in basket test is a valid method of marking in basket tests over a number of samples.

11.5 The Discriminant Analysis using the Variable 'Ontime'

As has already been described, two criterion variables were available for the study: one a general one of performance on the course in Industrial and Organisational Psychology and another which distinguished between those students who handed in all their assignments and work on time and those who did not. The description of how scores on these variables were derived was described earlier. It could be argued that one problem associated with a general criterion of success is that specific scoring categories such as those set out by Carlton and Brault (1971) and used in this research cannot be expected to account for much variance in the criterion. It could be further argued that it would be fairer to test 'related' scoring categories with a more specific criterion. In this context 'related' has the meaning that the categories should look as if they will predict the criterion performance.

This section deals with a discriminant analysis on the variable ontime, using relevant scoring categories which remained after the reliability study.

It was also noted that up to now, no work had been conducted which had attempted to use specific scoring categories of behaviour on an in basket test to predict similar specific behaviour in a real setting. The scoring categories available which bear directly on the behaviour expressed by a variable such as 'ontime' were:

V43 Schedules work specific week

V42 Schedules work specific day

V36 Delays or postpones decision

V52 Encourages quickness

V53 Sets a deadline

To further test hypothesis 1 and to gain further data on the validity and value of a multivariate approach to scoring the in basket test a discriminant analysis was conducted using a forced entry backward stepwise selection method using these variables to separate the groups on the basis of the variable 'ontime'. The structure of this variable was described in Chapter 7; this was Analysis 8. Unfortunately, it was only possible to obtain data for the 1977 extramural students. In the other samples students were not subjected to rigid dates for the handing in of assignments, so no records of the actual date assignments were presented for assessment were available. By choosing relevant variables and making available only those variables for the analysis, the necessity for further sampling to confirm the structure of the discriminant function is less necessary. The selection of relevant variables reduces the chance element associated with discriminant analysis which occurs when all variables are made available for entry.

11.6 The Classification Analysis

The main practical application for practitioners of discriminant analysis is the ability to classify applicants for jobs into successes and failures on the basis of a reliable discriminant function. Since it is impossible to know beforehand whether a reliable discriminant function will be obtained, it is not possible to know whether any classification procedure employed using any particular function will be valid. The main aims and hypothesis of this research are concerned with the evaluation of discriminant functions over a number of samples; classification analysis was not a primary concern of the research. It is, however, the point where the practical utility of discriminant analysis comes into its own. It has to be remembered that classification analysis only has utility if the discriminant function is valid and reasonably stable.

11.7 Summary of Proposed Discriminant Analyses

To test hypotheses one and two, eight discriminant analyses were planned on the separate samples of 1977 and 1978 extramural students and the 1978 internal students. Table 11.1 presents a summary of these analyses detailing the different forms of analysis, the dependent variable and short notes giving reasons for their calculation linked to the stated aims and hypotheses set out in Chapter 7. The rest of this chapter discusses the results obtained from these analyses.

11.8 Analysis 1 - Multivariate Analysis of the 1977 Extramural Sample

In Analysis 1 all reliable variables were used for entry into the discriminant function calculated using the 1977 extramural sample. The outcomes of the forced entry backward stepwise selection procedure are recorded in table 11.2. As can be seen, up to step 37 all the variables are forced into the discriminant function. Steps 38 to 65 detail the removal of variables which did not satisfy the criterion statistic requirements described earlier (Wilks lambda). The significance level of Wilks lambda is presented at every step, but it is only from step 38 that it is acted upon. Table 11.2 then shows the classification function and all the variables left which independently contribute to significant separation of the groups. The canonical correlation obtained for this analysis, as can be seen from table 11.2, is .421 which is significant at $p<.001$. Before commenting on this result it is necessary to carry out the other

Analysis No.	Form of Analysis	Criterion or Dependant Variable	Reasons for Calculation
1	Multivariate analysis using the 1977 Extramural student sample	Success or failure in course in industrial and organisational psychology	Part of the research to test hypothesis one, regarding the effectiveness of the multivariate approach and the single overall assessment approach to scoring the in-basket test
2	Multivariate analysis using the 1978 Extramural student sample using the variables significant in analysis one	"	" "
3	Multivariate analysis using the 1978 Internal student sample using the variables significant in analysis one	"	" "
4	Single variable analysis using the 1977 Extramural student sample	"	" " (This analysis was also conducted as part of the testing procedure for hypothesis two.)
5	Single variable analysis using the 1978 Extramural student sample	"	" " (This analysis was also conducted as part of the testing procedure for hypothesis two)
6	Single variable analysis using the 1978 Internal student sample	"	" " (This analysis was also conducted as part of the testing procedure for hypothesis two)
7	Single variable analysis using the combined sample of 1977 Extramural students and 1978 Internal and Extramural students	"	This analysis was conducted to provide an indication of the value of the single variable of overall assessment for the total group of subjects. This was conducted as part of testing hypothesis two
8	Selected multivariate analysis using variables relating to time, using the 1977 Extramural student sample	'On time' defined as whether student handed in any late assignment or whether all work was on time	Conducted to further evaluate the multivariate approach to scoring the in-basket test as part of hypothesis one

Table 11.1 Summary of Discriminant Analyses planned to test hypotheses one and two

SUMMARY TABLE

STEP	ACTION ENTERED	ACTION REMOVED	VARS IN	WILKS' LAMBDA	SIG.	LABEL
1	OVASS		1	0.963004	0.0099	OVERALL ASSESSMENT ON THE IN BASKET
2	V43		2	0.962095	0.0334	SCHEDULES WORK SPECIFIC WEEK
3	V20		3	0.958394	0.0566	DISCUSSES WITH SUBORDINATES
4	V3		4	0.956087	0.1120	NO OF SUBORDINATES INVOLVED
5	V1		5	0.927841	0.0227	ESTIMATED NO OF WORDS
6	V4		6	0.912959	0.0146	NO OF PEERS INVOLVED
7	V5		7	0.912931	0.0270	NO OF SUPERIORS INVOLVED
8	V16		8	0.912455	0.0446	COURTESY TO SUBORDINATES
9	V17		9	0.912449	0.0712	COURTESY TO PEERS
10	V18		10	0.909291	0.0900	COURTESY TO SUPERIORS
11	V21		11	0.907843	0.1211	DISCUSSES WITH PEERS
12	V22		12	0.907020	0.1620	DISCUSSES WITH SUPERIORS
13	AGE		13	0.890018	0.0989	
14	SEX		14	0.889395	0.1329	
15	V24		15	0.888203	0.1689	REQUIRES FURTHER INFORMATION
16	V25		16	0.884553	0.1897	ASKS FOR INFORMATION FROM SUBORDINATES
17	V26		17	0.881198	0.2135	ASKS FOR INFORMATION FROM PEERS
18	V27		18	0.880758	0.2640	ASKS INFORMATION FROM SUPERIORS
19	V30		19	0.880746	0.3233	GIVES DIRECTIONS TO SUBORDINATES
20	V34		20	0.872760	0.3037	COMMUNICATES BY WRITING
21	V35		21	0.872725	0.3636	COMMUNICATES FACE TO FACE
22	V36		22	0.870152	0.3966	DELAYS OR POSTPONES DECISION
23	V37		23	0.870066	0.4608	PROCEDURAL DECISION
24	V38		24	0.870060	0.5240	CONCLUDING DECISION
25	V39		25	0.869740	0.5824	MAKES PLANS ONLY
26	V40		26	0.865678	0.5982	TAKES LEADING ACTION
27	V41		27	0.863431	0.6326	TAKES TERMINAL ACTION
28	V42		28	0.848493	0.5337	SCHEDULES WORK SPECIFIC DAY
29	V52		29	0.830671	0.4106	ENCOURAGES QUICKNESS
30	V53		30	0.830667	0.4671	SETS A DEADLINE
31	V54		31	0.830161	0.5187	SETS UP CHECKS ON OTHERS
32	V55		32	0.830146	0.5743	SETS UP CHECKS ON HIMSELF
33	V56		33	0.822392	0.5529	CONCERN WITH PROPER CHANNELS
34	V57		34	0.821585	0.5990	RESPONDS WITH SPECIFICITY
35	V58		35	0.821484	0.6499	ITEM NOT ATTEMPTED
36	V59		36	0.811585	0.6091	NO OF USUAL COURSES OF ACTION
37	V60		37	0.789099	0.4518	NO OF UNUSUAL COURSES OF ACTION
38		V35	36	0.789130	0.4004	COMMUNICATES FACE TO FACE
39		V20	35	0.789168	0.3504	DISCUSSES WITH SUBORDINATES
40		V55	34	0.789212	0.3026	SETS UP CHECKS ON HIMSELF
41		V39	33	0.789273	0.2577	MAKES PLANS ONLY
42		V22	32	0.789456	0.2171	DISCUSSES WITH SUPERIORS
43		V5	31	0.789545	0.1795	NO OF SUPERIORS INVOLVED
44		V43	30	0.789747	0.1467	SCHEDULES WORK SPECIFIC WEEK
45		V30	29	0.789935	0.1178	GIVES DIRECTIONS TO SUBORDINATES
46		V59	28	0.790449	0.0942	NO OF USUAL COURSES OF ACTION
47		V57	27	0.790960	0.0741	RESPONDS WITH SPECIFICITY
48		V3	26	0.791427	0.0572	NO OF SUBORDINATES INVOLVED
49		V17	25	0.792005	0.0435	COURTESY TO PEERS
50		V21	24	0.792495	0.0324	DISCUSSES WITH PEERS

End of First section of Table 11.2

STEP	ACTION ENTERED	ACTION REMOVED	VARS IN	WILKS' LAMBDA	SIG.	LABEL
51		V27	23	0.793407	0.0241	ASKS INFORMATION FROM SUPERIORS
52		V16	22	0.794251	0.0175	COURTESY TO SUBORDINATES
53		V38	21	0.795370	0.0127	CONCLUDING DECISION
54		V26	20	0.796125	0.0088	ASKS FOR INFORMATION FROM PEERS
55		V25	19	0.797412	0.0062	ASKS FOR INFORMATION FROM SUBORDINATES
56		V58	18	0.798983	0.0043	ITEM NOT ATTEMPTED
57		V53	17	0.800665	0.0030	SETS A DEADLINE
58		V41	16	0.802767	0.0020	TAKES TERMINAL ACTION
59		V54	15	0.804749	0.0014	SETS UP CHECKS ON OTHERS
60		SEX	14	0.806687	0.0009	
61		V36	13	0.808619	0.0006	DELAYS OR POSTPONES DECISION
62		V18	12	0.811662	0.0004	COURTESY TO SUPERIORS
63		V4	11	0.815481	0.0003	NO OF PEERS INVOLVED
64		V37	10	0.819250	0.0002	PROCEDURAL DECISION
65		V40	9	0.822822	0.0001	TAKES LEADING ACTION

CLASSIFICATION FUNCTION COEFFICIENTS
(FISHER'S LINEAR DISCRIMINANT FUNCTIONS)

SUCCESS =	1 PASS COURSE	2 FAIL COURSE
OVASS	0.4433633E-01	-0.6235927
V1	0.4760875	0.5567100
AGE	0.4777011	0.5618134
V24	-0.9381595	-1.343216
V34	0.6161839	0.7185047
V42	-0.7698090E-01	-0.2229297
V52	-0.4607758	-1.008439
V56	1.742342	-0.4222318
V60	2.106995	2.624457
(CONSTANT)	-30.22550	-39.43755

CANONICAL DISCRIMINANT FUNCTIONS

FUNCTION	EIGENVALUE	PERCENT OF VARIANCE	CUMULATIVE PERCENT	CANONICAL CORRELATION	:	AFTER FUNCTION	WILKS' LAMBDA	CHI-SQUARED	D.F.	SIGNIFICANCE
					:	0	0.8228220	33.640	9	0.0001
1	0.21533	100.00	100.00	0.4209251	:					

Table 11.2 Results of Forced Entry with Backward Stepwise Selection using all available variables for the 1977 Extramural Student Sample

analyses which were conducted to test hypothesis one.

11.9 Analysis 2 - Multivariate Analysis of the 1978 Extramural Sample

In Analysis 2 the nine variables which contributed to significant separation in Analysis 1 of the two groups pass/fail on the criterion success were used to test their ability to separate the same groups in the 1978 extramural sample. This was done to test the stability of the multivariate discriminant function calculated in Analysis 1 as part of the procedure for testing hypothesis one.

The variables which formed the function in Analysis 1 were:

Ovass	Overall Assessment on the in basket
V1	Estimated no of words
Age	Age of the subject
V24	Requires further information
V34	Communicates by Writing
V42	Schedules work specific day
V52	Encourages Quickness
V56	Concern with Proper Channels
V60	No. of Unusual Courses of Action

Table 11.3 shows in steps 1 to 9 the forced entry of the nine variables. At this stage, although the criterion statistics for the entry and removal of variables are presented, they are not acted upon. Steps 10 to 15 show that V52, V60, Age, V42, V24, and V34 were removed from the discriminant function in Analysis 2 because they did not meet the criterion statistic level for remaining in the

SUMMARY TABLE

STEP	ACTION ENTERED	ACTION REMOVED	VARS IN	WILKS' LAMBDA	SIG.	LABEL
1	OVASS		1	0.976056	0.1132	OVERALL ASSESSMENT ON THE IN BASKET
2	V1		2	0.901010	0.0047	ESTIMATED NO OF WORDS
3	AGE		3	0.898002	0.0116	
4	V24		4	0.896411	0.0249	REQUIRES FURTHER INFORMATION
5	V34		5	0.890977	0.0389	COMMUNICATES BY WRITING
6	V42		6	0.889715	0.0666	SCHEDULES WORK SPECIFIC DAY
7	V52		7	0.888796	0.1059	ENCOURAGES QUICKNESS
8	V56		8	0.877413	0.1095	CONCERN WITH PROPER CHANNELS
9	V60		9	0.875895	0.1548	NO OF UNUSUAL COURSES OF ACTION
10		V52	8	0.876248	0.1051	ENCOURAGES QUICKNESS
11		V60	7	0.877812	0.0699	NO OF UNUSUAL COURSES OF ACTION
12		AGE	6	0.879528	0.0437	
13		V42	5	0.881763	0.0256	SCHEDULES WORK SPECIFIC DAY
14		V24	4	0.885218	0.0144	REQUIRES FURTHER INFORMATION
15		V34	3	0.890422	0.0078	COMMUNICATES BY WRITING

CLASSIFICATION FUNCTION COEFFICIENTS
(FISHER'S LINEAR DISCRIMINANT FUNCTIONS)

SUCCESS =	1 PASS COURSE	2 FAIL COURSE
OVASS	0.5498638	-0.1091115
V1	0.5525579	0.6355631
V56	-6.227222	-4.198227
(CONSTANT)	-18.13604	-21.18323

CANONICAL DISCRIMINANT FUNCTIONS

FUNCTION	EIGENVALUE	PERCENT OF VARIANCE	CUMULATIVE PERCENT	CANONICAL CORRELATION	:	AFTER FUNCTION	WILKS' LAMBDA	CHI-SQUARED	D.F.	SIGNIFICANCE
					:	0	0.8904220	11.896	3	0.0077
1	0.12306	100.00	100.00	0.3310257	:					

Table 11.3 Results of the discriminant analysis on the 1978 Extramural Student sample using variables selected for the discriminant function using the 1977 Extramural Student sample

function. The next part of table 11.3 shows the three variables (Ovass, V1, and V56) which remained in the function at the end of the stepwise procedure. Using these variables the canonical correlation obtained for this analysis, as can be seen from table 11.3, was .33 with a $p<.01$.

It would appear that with this sample the value of the canonical correlation is lower but the function is still significant. To further test the value of the multivariate approach an analysis of the 1978 internal sample was conducted. Before any comprehensive discussion of the value of the multivariate approach and hypothesis one, it is necessary to describe all the other analyses which play a part in testing this hypothesis.

11.10 Analysis 3 - Multivariate Analysis of the 1978 Internal Sample

In Analysis 3 the nine variables which contributed to the significant separation in Analysis 1 were again used to test their ability to separate the two groups described by pass/fail on the criterion success. This time the 1978 internal students were the sample on which the discriminant analysis was conducted. Again this analysis was conducted to further test hypothesis one and the value of the multivariate approach to scoring the in basket test.

The results are shown in table 11.4 which up to step 8 shows the variables which were forced into the function regardless of the value of Wilks lambda, the criterion statistic. V56 failed to meet the minimum tolerance level of .001 as a variable, with this sample,

SUMMARY TABLE

STEP	ACTION ENTERED	ACTION REMOVED	VARS IN	WILKS' LAMBDA	SIG.	LABEL
1	OVASS		1	0.991770	0.4944	OVERALL ASSESSMENT ON THE IN BASKET
2	V1		2	0.984239	0.6409	ESTIMATED NO OF WORDS
3	AGE		3	0.975850	0.7157	
4	V24		4	0.974418	0.8398	REQUIRES FURTHER INFORMATION
5	V34		5	0.972784	0.9127	COMMUNICATES BY WRITING
6	V42		6	0.922171	0.6264	SCHEDULES WORK SPECIFIC DAY
7	V52		7	0.921958	0.7395	ENCOURAGES QUICKNESS
8	V60		8	0.920086	0.8185	NO OF UNUSUAL COURSES OF ACTION
9		V34	7	0.920116	0.7268	COMMUNICATES BY WRITING
10		V52	6	0.920857	0.6161	ENCOURAGES QUICKNESS
11		V60	5	0.922865	0.4971	NO OF UNUSUAL COURSES OF ACTION
12		V24	4	0.924485	0.3648	REQUIRES FURTHER INFORMATION
13		OVASS	3	0.927827	0.2450	OVERALL ASSESSMENT ON THE IN BASKET
14		AGE	2	0.930713	0.1339	
15		V1	1	0.941566	0.0651	ESTIMATED NO OF WORDS

CLASSIFICATION FUNCTION COEFFICIENTS
(FISHER'S LINEAR DISCRIMINANT FUNCTIONS)

SUCCESS =	1 PASS COURSE	2 FAIL COURSE
V42	0.3235354	0.7799513E-01
(CONSTANT)	-0.5584621	-1.455193

CANONICAL DISCRIMINANT FUNCTIONS

FUNCTION	EIGENVALUE	PERCENT OF VARIANCE	CUMULATIVE PERCENT	CANONICAL CORRELATION	:	AFTER FUNCTION	WILKS' LAMBDA	CHI-SQUARED	D.F.	SIGNIFICANCE
					:	0	0.9415660	3.4019	1	0.0651
1	0.06206	100.00	100.00	0.2417312	:					

Table 11.4 Results of the discriminant analysis on the 1978 Internal student sample using variables selected for the discriminant function in the 1977 Extramural student sample

to be forced into the function. Tolerance refers to the proportion of a variable's within-group variance not accounted for by other variables at a particular step in the analysis. The calculated tolerance level of V56 was 0.0000 and consequently the variable was not forced into the function and does not appear in the summary table in table 11.4. Table 11.4 shows that of the eight variables forced into the function, seven were removed, leaving V42 to form the single variable discriminant function whose canonical correlation is .241 which is not significant with $p>.05$.

From the first three analyses no variable appears in all three functions. This suggests that the multivariate approach lacks stability when evaluated over a number of samples. Analysis 8 considers the value of the multivariate approach in a different way, by considering relevant variables and their ability to predict performance on the criterion 'ontime'. Further discussion is reserved for the section after this Analysis.

11.11 Analyses 4, 5 and 6: Tests of the Single Variable Overall Assessment on the Three Student Samples

Analyses 4, 5 and 6 were conducted to compare the functions obtained using the single variable of overall assessment on the in basket test to the functions obtained in Analyses 1, 2 and 3. This was done to test hypothesis one and evaluate the value of the two approaches.

Table 11.5 shows the results of the discriminant analysis using the single variable of overall assessment of performance on the in basket test to separate the groups pass and fail on the variable success, using the 1977 extramural sample.

From the table it can be seen that the single variable of overall assessment of performance on the in basket test entered the function and produced a canonical correlation of .192 which is significant at $p<.01$. This is an excellent result for the overall assessment variable but to fully test hypothesis one analyses are required using further samples, namely the 1978 extramural student sample and the 1978 internal sample. These were Analyses 5 and 6.

Analysis 5 used the single variable of overall assessment of performance on the in basket test to separate the groups pass and fail on the variable success, using the 1978 extramural student sample. The results of this analysis are shown in table 11.6.

As can be seen the variable again successfully entered and remained in the function with a canonical correlation of .155 but with $p>.05$. In the case of this analysis the variable provided enough separation of the groups according to the Wilks criterion, but the resulting canonical correlation was not significant. This suggests that the separation achieved could have been a chance result.

Analysis 6 used the single variable of overall assessment of performance on the in basket test to separate the groups pass and fail on the variable success, using the 1978 internal student sample. The results of this analysis are shown in table 11.7. On

SUMMARY TABLE

STEP	ACTION ENTERED	ACTION REMOVED	VARS IN	WILKS' LAMBDA	SIG.	LABEL
1	OVASS		1	0.963004	0.0099	OVERALL ASSESSMENT ON THE IN BASKET

CANONICAL DISCRIMINANT FUNCTIONS

FUNCTION	EIGENVALUE	PERCENT OF VARIANCE	CUMULATIVE PERCENT	CANONICAL CORRELATION	:	AFTER FUNCTION	WILKS' LAMBDA	CHI-SQUARED	D.F.	SIGNIFICANCE
					:	0	0.9630035	6.6537	1	0.0099
1	0.03842	100.00	100.00	0.1923447	:					

Table 11.5 Results of discriminant analysis on the 1977 Extramural student sample using the single variable of overall assessment of performance on the in basket test

SUMMARY TABLE

STEP	ACTION ENTERED	ACTION REMOVED	VARS IN	WILKS' LAMBDA	SIG.	LABEL
1	OVASS		1	0.976056	0.1132	OVERALL ASSESSMENT ON THE IN BASKET

CLASSIFICATION FUNCTION COEFFICIENTS
(FISHER'S LINEAR DISCRIMINANT FUNCTIONS)

SUCCESS =	1 PASS COURSE	2 FAIL COURSE
OVASS	2.767720	2.499962
(CONSTANT)	-7.597929	-7.474877

CANONICAL DISCRIMINANT FUNCTIONS

FUNCTION	EIGENVALUE	PERCENT OF VARIANCE	CUMULATIVE PERCENT	CANONICAL CORRELATION	:	AFTER FUNCTION	WILKS' LAMBDA	CHI-SQUARED	D.F.	SIGNIFICANCE
					:	0	0.9760558	2.5084	1	0.1132
1	0.02453	100.00	100.00	0.1547391	:					

Table 11.6 Results of the discriminant analysis using the single variable of overall assessment on the in basket test

this occasion the variable failed to enter the discriminant function because it did not reach the required level of Wilks lambda. This indicated that for this sample, the overall assessment of performance on the in basket test provided no significant separation between the groups.

While this is not a good result for the overall assessment of performance on the in basket test, the result could be explained by the smallness of the sample, or more probably through the nature of the sample itself. As was stated earlier the extramural students are more likely to be representative of a managerial group than are internal students. One important difference is their ages but this also leads to a great difference between the groups in terms of work experience.

11.12 Analysis 7 - Single Variable Analysis of the Total Sample

As a means of completing the picture concerning the value of the overall assessment of performance on the in basket test a discriminant analysis was conducted using the variable to separate the criterion pass/fail on the variable success using the whole sample of all three groups of students. This was Analysis 7.

The results of Analysis 7 are shown in table 11.8. The summary table shows that the single variable of overall assessment of performance on the in basket test successfully entered the function and that the resulting canonical correlation of .168 was significant at the $p<.01$ level. Despite the results achieved with the 1978

VARIABLE	TOLERANCE	MINIMUM TOLERANCE	F TO ENTER	WILKS' LAMBDA
OVASS	1.0000000	1.0000000	0.47303	0.9917696

F LEVEL OR TOLERANCE OR VIN INSUFFICIENT FOR FURTHER COMPUTATION.

NO VARIABLES QUALIFIED FOR THE ANALYSIS, SO IT IS BEING ABANDONED.

Table 11.7 Results of the discriminant analysis using the single variable of overall assessment on the 1978 Internal student sample

SUMMARY TABLE

STEP	ACTION ENTERED	ACTION REMOVED	VARS IN	WILKS' LAMBDA	SIG.	LABEL
1	OVASS		1	0.971756	0.0018	OVERALL ASSESSMENT ON THE IN BASKET

CLASSIFICATION FUNCTION COEFFICIENTS
(FISHER'S LINEAR DISCRIMINANT FUNCTIONS)

SUCCESS =	1 PASS COURSE	2 FAIL COURSE
OVASS	2.351531	2.049062
(CONSTANT)	-6.675508	-6.769684

CANONICAL DISCRIMINANT FUNCTIONS

FUNCTION	EIGENVALUE	PERCENT OF VARIANCE	CUMULATIVE PERCENT	CANONICAL CORRELATION	:	AFTER FUNCTION	WILKS' LAMBDA	CHI-SQUARED	D.F.	SIGNIFICANCE
					:	0	0.9717561	9.7841	1	0.0018
1	0.02906	100.00	100.00	0.1680593	:					

Table 11.8 Results of the discriminant analysis using the single variable of overall assessment on the in basket test with the 1977 and 1978 Extramural student sample and the 1978 Internal student sample

internal students the effect with that group was not strong enough to remove the ability of the single variable of overall assessment of performance on the in basket test to separate the two groups.

11.13 Analysis 8 - Multivariate Analysis on 'Ontime'

Before finally rejecting or accepting hypotheses one and two it was necessary to test the multivariate approach in a situation where there could be a reasonable expectation that the variables would predict the criterion. This was necessary because it could be argued that a global variable such as an overall assessment of performance on the in basket test would be more likely to have common variance with a criterion which also looked at performance in a global way such as the success variable used so far in this section of the research. The fact that the overall assessment of performance on the in basket test accounts for most variance in two of the multivariate discriminant analyses conducted so far (Analyses 1 and 2) supports this (see tables 11.2 and 11.3 where it can be seen that this variable on both occasions enters the function first).

The criterion 'ontime' has already been described. Essentially it was a division of students into those who managed to hand all their work in on time and those who failed to do so, even if it was only by one day and on one occasion. To separate these two groups, variables were selected from the scoring method which were thought likely to be relevant to this behaviour and would consequently contribute to separating the groups. The variables chosen were:

V43 Schedules work specific week

V42 Schedules work specific day

V36 Delays or postpones decision

V52 Encourages Quickness

V53 Sets a Deadline

Table 11.9 shows the results of stepping in these variables to form a discriminant function to separate these groups. Again a forced entry backward stepwise selection procedure was used. The resulting discriminant function had three variables in it with a canonical correlation of .195 with a $p>.05$ (which is not significant). This means that for this sample these variables contribute little to the significant separation of the groups of students on the variable 'ontime'.

11.14 Discussion of Analyses related to Hypotheses 1 and 2

The eight analyses conducted have shown that in four tests of a multivariate approach to predicting performance using the Plasto in basket test, no consistent results have emerged. In the case of the attempts to predict performance on the criterion success two significant functions are obtained but the failure of relevant variables in Analysis 8 to predict performance on the criterion 'ontime' suggests that the multivariate approach using the scoring method devised by Carlton and Brault (1971) may be deficient in replicable validity. It is also important to note that in Analyses 1 and 2, which showed some consistency, a large amount of the significant variance was contributed by the single variable of

SUMMARY TABLE

STEP	ACTION ENTERED	ACTION REMOVED	VARS IN	WILKS' LAMBDA	SIG.	LABEL
1	V43		1	0.998503	0.5942	SCHEDULES WORK SPECIFIC WEEK
2	V42		2	0.984780	0.2347	SCHEDULES WORK SPECIFIC DAY
3	V36		3	0.972752	0.1572	DELAYS OR POSTPONES DECISION
4	V52		4	0.961586	0.1179	ENCOURAGES QUICKNESS
5	V53		5	0.957091	0.1444	SETS A DEADLINE
6		V43	4	0.957356	0.0848	SCHEDULES WORK SPECIFIC WEEK
7		V53	3	0.962119	0.0635	SETS A DEADLINE

CLASSIFICATION FUNCTION COEFFICIENTS
(FISHER'S LINEAR DISCRIMINANT FUNCTIONS)

ONTIME =	1	2
V42	0.3208362	0.2075781
V36	0.1320754	0.5846696
V52	0.9135704	0.4800105
(CONSTANT)	-3.785275	-0.7335450

CANONICAL DISCRIMINANT FUNCTIONS

FUNCTION	EIGENVALUE	PERCENT OF VARIANCE	CUMULATIVE PERCENT	CANONICAL CORRELATION	:	AFTER FUNCTION	WILKS' LAMBDA	CHI-SQUARED	D.F.	SIGNIFICANCE
					:	0	0.9621193	7.2793	3	0.0635
1	0.03937	100.00	100.00	0.1946297	:					

Table 11.9 Results of the discriminant analysis using five relevant variables to discriminate between students who handed an assignment in late and those who did not

overall assessment of performance on the in basket test.

Hypothesis One states that a single variable of overall assessment of performance on the in basket test would be at least as good as a multivariate method of scoring the test for predicting performance over a number of separate samples. Analyses 4 to 7 consider the value of the single variable of overall assessment of performance on the in basket test. While overwhelming consistency in the results was not found, the results in general were as good as those for the multivariate approach over a number of samples. The poor results obtained in Analysis 6 using the internal students can be explained by the nature of the sample and the point already made that extramural students, because of their greater average age, are more likely to be similar in this respect to a management group. In general terms the eight analyses in this section of the research suggest that hypotheses one and two should be accepted. However, the true test of the value of the in basket test is its validity in a practical setting. Further research was therefore conducted to test hypothesis four concerning the value of the in basket test in a practical setting and also to provide further data for the evaluation of hypothesis two.

11.15 Summary of the Results of the Discriminant Analyses

Eight discriminant analyses were conducted as part of the testing of hypotheses 1 and 2. Table 11.1 presented each analysis with a reason for its calculation. In Analysis 1 all reliable variables including age and sex were used for entry into the discriminant function calculated using the 1977 extramural student sample. This resulted in nine variables forming the function which gave a canonical correlation of .421 which is significant at $p < .001$. Analysis 2 used these same nine variables to separate the 1978 extramural students on the same variable success. On this occasion only three of these variables were accepted into the function. The canonical correlation for this analysis was .33 with $p < .01$. In Analysis 3 the same nine variables were used to separate the 1978 internal student sample on the variable success. On this occasion the canonical correlation obtained was .241 which is not significant with $p > .05$. From these analyses it was found that no variable formed a part of all three functions. The multivariate approach was perhaps more fairly tested in Analysis 8 where variables relevant to time were selected in an attempt to separate groups on the criterion 'ontime'. The canonical correlation for the analysis was .195 which is not significant ($p > .05$).

Analyses 4, 5, 6, and 7 used the single variable of overall assessment of performance on the in basket test as the single variable predictor. This variable was again used to separate the groups formed from the criterion success. The differences between the analyses were in the samples used. Analysis 4 used the 1977 extramural students, Analysis 5 used the 1978 extramural students, Analysis 6 used the 1978 internal students, and Analysis 7 used the combined sample of students. The results of Analysis 4 produced a canonical correlation of .192 which is significant at $p < .01$. Analysis 5 produced a canonical correlation of .155; this result was not significant. In Analysis 6 the single variable of overall assessment of performance on the in basket test failed to enter the equation resulting in the analysis being abandoned. Analysis 7 produced a canonical correlation of .168 which was significant at the $p < .01$ level. The results of all these analyses led to the conclusion that there was some support for hypothesis one and that the single variable of overall assessment of performance on the in basket test was as good as a multivariate method of scoring the test for predicting performance over a number of samples. It was felt that the research designed to test hypothesis four in chapter 12 would provide further evidence in relation to hypothesis 2, but that some evidence of the validity of the single variable of overall assessment of performance on the in basket test was apparent. It was also noted that in two of the multivariate analyses this variable provided the largest amount of separation between the two groups in the criterion.

CHAPTER 12

THE FREEZING WORKS STUDY

12.1 Introduction to the Study

The main study of this research has concentrated on the assessment of the psychometric aspects of the in basket test. To achieve this the necessity of obtaining a large enough sample for an adequate treatment of the data has been given as the reason for using students as the subjects for the research. Despite the fact that the main groups of students were rather more comparable to managers than is usually the case when students are used as subjects, it was important to further test the value of in basket testing in an industrial setting. This was deemed necessary to complete the evaluation of in basket assessments as true practical psychology, that is as psychologically based techniques which, after suitable training, may be devised and applied by a non psychological practitioner. The application of an in basket to assessment of an industrial sample was undertaken also to validate further the technique, on this occasion in a real life setting. Hypothesis four stated: the in basket test can be designed and administered by a practitioner and be shown to have limited concurrent validity. The research described in this chapter was conducted to test this hypothesis.

12.2 The In Basket Design Process

One of the strengths of the work sample approach as a whole is its use of a job analysis for the design of the test. In the design of the Plasto in basket test for the main body of this research the problems associated with the design, as a result of not having a specific job to focus on, has already been described. The arguably artificial nature of the design of the Plasto test led the writer to test further the in basket test technique in a practical setting ,in order to ensure that it fulfilled all the requirements for being regarded as practical psychology. The in basket design process takes its main thrust from the work done on manual work sample tests, especially that of Downs' (1968,1977) work on trainability assessments. In this procedure practitioners are discouraged from taking a test that has already been designed for use elsewhere, but are presented with a methodology which allows them to design their own test and to evaluate it if they wish. The true test of the worth of the work sample approach rests in the ability of a test that has been designed by practitioners to discriminate between good and poor performers in their organisation. Another aim of this part of the research was to discover how well this could be done using an in basket test.

12.3 The Instructions for the Design of the Practitioner's In Basket Test

The instructions were largely based on the work of Downs (1977) on trainability assessments. She divided up the task of designing such tests into three major parts, analysing the job, selecting the work piece or task, and writing the error check list. This was also used as the basis for the instructions to the designer in the practical situation. The exception was that selecting the work piece and writing the error check list have different meanings for the in basket test. During these stages the designer selects the in basket tasks and draws up the background sheet, the job description, and the organisational chart. In the present study these were based on the real organisation, although names were changed for ethical and legal reasons. The test was then given to people in the organisation and tested for its value in discriminating between employees presently with the organisation, designated on an independent criterion good or bad in the job on which the test was designed to discriminate. The test results were then assessed using an overall assessment of performance similar to that used for the Plasto in basket test. These results compared to the performance appraisal given to people on the job give a measure of the technique's concurrent validity In most settings, and the present one is no exception, it is necessary to train staff involved as non-psychological practitioners. This training may take the form of a course of personal instruction adapted to the current knowledge and intelligence of the practitioner, as in the present case described above, or when the numbers of trainees are large the training may be a more formal course. The writer has found from experience that a short three day course is most appropriate. The formal course would consist of a half day introduction and general background to selection. The material covered would include much of the material on selection reviewed in this thesis (see pp19-77), but presented in a form more palatable to practitioners, without misrepresenting the research. A further half day would be spent considering the various methods available for conducting job analyses and giving trainees the opportunity to carry some of them out. The first half of the second day would emphasise the link between job analyses and selection techniques in general and work sample tests in particular The relationship of in basket tests to this genre would be highlighted. Actual examples of work sample tests would be shown to trainees at this stage. Included would be manual work samples, in basket tests, and more unusual forms of work sample test such as that of Melbourne Test 90 (Lafitte 1954 for description see p76). The second half of the second day would discuss the principles of test design in general and the work sample test in particular. Material on the Work Sample Test and Other Test Design (see pp78-82) would also be included in this section again presented using an introductory format without compromising the facts. On the morning of the third day trainees would be given a job analysis of a managerial position in a situation similar to those in which the trainees are employed and would be required to make an attempt at designing an in basket test for this postion. Their progress would be monitored through some individual instruction, and feedback on their progress would be given. At this point an attempt would be made to introduce some preliminary concepts concerning the importance of evaluation. The final afternoon session would deal with the concept of validity and its importance if an in basket test or any selection instrument is to be used on a continuing basis. This final session would also include information on how to conduct a rudimentary validity study so that any in basket test designed by a practitioner could be evaluated. Practitioners would be encouraged to employ, at a later date, a qualified psychologist to carry out a full evaluation study.

12.4 The Industry in which the Practical Study took Place

This part of the research was conducted in the freezing industry, because of its importance to New Zealand. The freezing industry is responsible for a major part of the exports of the country which is largely dependent upon it for its survival. The choice of the freezing industry was also made because if the in basket test succeeded in this industry it would help its development as a practical test for practitioners. The influence the industry has in New Zealand as a whole would provide maximum publicity for the method, which in turn would give a maximum opportunity of generating further interest. The particular freezing works used was based in the North Island of New Zealand and the job chosen for the evaluation was that of foreman.

12.5 The Dollrier Freezing Works In Basket

The job description, fact sheet, organisation chart, and in basket items devised are shown in Appendix 13. The test itself was largely designea by the officer in charge of personnel matters with some help from the author, who limited this help to the answering of specific questions which might be legitimately asked by any practitioner designing their first test. The person concerned had also done some courses in psychology. The Plasto in basket test was made available to him as was some literature on in basket tests in general. Using this technique it was possible to make a subjective assessment of the test in terms of the job that it was based on.

12.6 The Validity of the Dollrier In Basket Test

One of the problems with any research in a practical setting is the difficulty of obtaining a sufficient sample of subjects to generate meaningful validity coefficients. This has long been recognised in validity studies in industrial and organisational psychology and explains the necessity of implying limitations to a hypothesis dealing with the validity of a selection instrument in a field setting. It is also important to appreciate that validations which involve inferences about the relationship of a test score to a criterion can either be 'predictive' or 'concurrent'. It is errorneous to speak of 'the validity' since the term is not singular (Dunnette 1976). It is also as well to remember that; as many writers on occupational psychology have pointed out (e.g Dunnette 1976, Blum and Naylor 1968), the criteria themselves are notoriously unreliable in the statistical sense.

In this study eleven workers were chosen from within the freezing works who, according to the judgement of the designer of the test before the test was constructed, had been with the organisation sufficiently long enough for them to be generally assessed on the criterion. No formal scales of assessment were used, but immediate superiors were asked, based on their knowledge of the persons and their present work, to classify the group into potentially successful and unsuccessful in the job of foreman in the company.

This job was well known to the people carrying out the assessments. These assessments were

Subject	Overall Assessment rating	Group
1	5	Successful
2	4	Unsuccessful
3	5	Successful
4	6	Successful
5	6	Successful
6	5	Successful
7	4	Unsuccessful
8	6	Successful
9	5	Unsuccessful
10	6	Successful
11	7	Successful

Table 12.1 Overall assessments and group criterion affiliations obtained from the concurrent validity study.

not available to the designer of the test, who scored the in basket test using a simple overall assessment of how well he thought each person had done. This in basket test method allows the scorer to choose the way he collects the rating of overall assessment. In this case, each item was given a mark if it was acceptable and none if it was unacceptable. Some items were given a half mark for partial acceptability. The marks were translated to a scale by the scorer, where excellent was a score of 9 and 1 was poor.

12.7 The Analysis of the Dollrier In Baskets

The analysis of the in basket test in this study proved to be somewhat difficult because of the small number of subjects available. A discriminant analysis in this instance was inappropriate because only two people who took the in basket were regarded as poor. The overall assessments given to the eleven people who completed the test and their assigned group are shown in table 12.1. Overall assessment ratings of 5 and above were regarded as a successful completion of the in basket test, scores of four and below were regarded as an unsuccessful completion of the test. The table shows that predictions from the test were correct for ten of the eleven subjects. This appears very impressive, but some inductive statistical procedure would help to show that this result is better than chance. The obvious procedure is to correlate the assessments of performance on the test with the criterion of on the job performance. In this case, to compensate for the tied rankings in the small sample and the non normal distribution for the dependent variable, a non parametric correlation was used. There are two forms of non parametric correlation available in the literature, Spearman's rho, and Kendall's tau (Siegel 1956). The main differences between the two, since both methods calculate correlations using ranking procedures, seems to be that Kendall coefficients are more valid when there are a large number of tied ranks in the data. Spearman's rho is, however, a good approximation to a product moment correlation when the data is more or less continuous (Nie et al 1974). If this is used as a method of discriminating between the two correlational techniques, there is some doubt about the value of Spearman's rho because the conditions necessary for its valid use would not compromise the product moment correlation sufficiently to prevent it being used instead. Kendall's coefficient tends to be used when a reasonably large number of cases are classified into a relatively small number of categories and Spearman's rho when the ratio of cases to categories is smaller. Another difference in calculation is that Kendall's tau is more conservative in its presentation of the association between two variables. For the present study, since there appeared to be no clear cut reason to adopt one method in preference for another, both methods were used. They produced results of .66 $p<.05$ (Kendall's tau) and .71 p<.01 (Spearman's rho). These results were interpreted as quite clearly showing a significant relationship between the assessments of performance on the in basket test and the assessments of on the job performance. The results suggest that hypothesis four should be accepted and that this study has demonstrated that an in basket test can be designed and administered by a practitioner and show concurrent validity. This research is also a further test of hypothesis two and provides increased evidence of the validity of the single variable of overall assessment of performance on the in basket test as a predictor of performance. Taken with the research on the Plasto in basket test the research described in this chapter demonstrates that the in basket test is practical psychology.

12.8 Summary

In the Freezing Works study an attempt was made to discover the robustness of the in basket test when it was designed by a practitioner. The study incorporated a check of the success of the test and it was found to be a valid measure of the criterion assessment of foremen in a real company. This led to the acceptance of hypothesis four concerning the practical utility of the technique and as a consequence it was concluded that the in basket test can be regarded as practical psychology.

Chapter 13

SUMMARY AND CONCLUSIONS

13.1 Summary of Research Findings

The main aim of the research described in this thesis was to demonstrate the value of the in basket test as a part of practical psychology. Four hypotheses were postulated to fulfil this purpose. They were:

1. A single variable of overall assessment of performance on the in basket test would be at least as good as a multivariate method of scoring the test over a number of samples.
2. The single variable of overall assessment of performance on the in basket test is a valid method of marking in basket tests over a number of samples.
3. The overall assessment of performance on the in basket test is a reliable measure of in basket performance.
4. The in basket test can be designed and administered by a practitioner and be shown to have limited concurrent validity.

The research was divided into four parts to test these hypotheses. There was a reliability study, a factor analytic study, a discriminant analysis study and a study in a practical setting (a Freezing Works).

In the reliability study an argument was made for the inappropriateness of conventional reliability measures in a test of this kind. However a satisfactory inter scorer reliability is necessary not only for the single variable of overall performance on the in basket test but also for all variables to be used in the research using factor analysis and discriminant analysis. The inter scorer reliability of the variable 'Overall assessment of performance on the in basket test' was established as was the reliability of the 34 other variables which were used in subsequent analyses. As a result of this study it was concluded that hypothesis three, as far as it could be tested, should be accepted, and that the overall assessment of performance on the in basket test is a reliable measure of in basket performance.

The factor analytic studies were carried out with the aim of aiding the testing of hypothesis one, so that a rationale could be used for the stepwise inclusion of variables in the discriminant analyses contemplated to test this hypothesis. This would also help the subsidiary aim of the research to assess the value of the multivariate approach for predictive purposes in applied psychology. The results of the research showed good internal consistency but there was little that was comparable to earlier factor analytic studies of in basket test scoring categories. It was suggested that this could be because of the very different nature of the situations presented in the in basket tests. Largely because of this great discrepancy it was decided that the results of the factor analytic study would not be used as a rationale for the stepwise inclusion of variables in the discriminant analyses. The easy implementation of a forced entry backward stepwise selection technique for use in the discriminant analyses facilitated this decision. It was also argued that as a result of the factor analyses on the in basket test that in basket tests are situationally distinct and that for this situation the factor studies showed stability.

The discriminant analyses were conducted to test hypotheses one and two: eight analyses were conducted in all. The results led to the conclusion that the results obtained using the single variable of overall assessment of performance on the in basket test to predict performance were as good as the results using a multivariate approach. This result was further confirmed in the Freezing Works study which led to the acceptance of hypothesis one. The results also indicated that the single variable of overall assessment of performance on the in basket test was a valid method of marking in basket tests over a number of samples. This led to the acceptance of hypothesis two.

The Freezing Works study was conducted to test hypothesis four. The Dollrier in basket test had a high concurrent validity coefficient with performance. This, and the observation of the process, led to the conclusion that the in basket test could be designed and administered by a trained practitioner and be a valid method of selection which consequently led to the acceptance of hypothesis four.

13.2 Conclusions and Future Progress

The research in general, as stated earlier, was designed to demonstrate the value of the in basket test as a part of practical psychology. By establishing that the test can be valid and be used by a practitioner in a practical setting, as well as showing that the single variable of overall assessment on the in basket test is a valid method of scoring the test over a number of samples, it is contended that the value of the in basket test for practical psychology has been demonstrated. Practical psychology, however, should also include suggestions about the implementation of research techniques such as the work sample test if they are to be used more by practitioners.

Up to now psychologists have not played a large part in the guidance of practitioners, largely because they feel that there is little to contribute, or because they feel, like Fine (1975) rather negative about selection procedures in industry.

Fine (1975), in an attack on selection procedures currently used, argues that they are frequently used to provide a cover for discrimination so that the organisation may hire the type of worker they want in terms of sex and race, and for this reason it is unlikely that they are hiring the best workers. To counter this, Fine argues for random selection of individuals into organisations. He believes in the greater use of differential placement rather than selection. He sees the selection methods that are available as screens that penalise people "for being what they are". Using this method an employer, instead of selecting a person for a pre-determined vacancy, randomly selects an appropriate number of people and attempts to match the various tasks that have to be done, to the abilities which these people possess.

This approach is not only extremely negative, but random selection would also be unacceptable in industry. From a political perspective the present research has demonstrated some of the practical utility of work sample tests. What is needed is an increased awareness of the political aspects of selection by psychologists which has so far not been very forthcoming.

According to Dunnette (1963) models of the selection process "... take account of the complex interactions which may occur between predictors and various predictor combinations, different groups (or types) of individuals, different behaviours on the job and the consequences of these behaviours relative to the goals of the organisation". The one thing they take little notice of, however, is the political climate of the organisation itself: a very important element of reality is missing. Argyris (1972) has challenged psychologists to stop ignoring crucial variables and problems in the area and to prevent the take over by society of what was originally the domain of the psychologist. In a later article Argyris (1976) suggests that the development of Business Schools over the last twenty years has led to the graduates of these schools not being as doctrinaire as their older predecessors:- "They tend to see less sacredness in maintaining the present technology, organisational structure, administrative controls and in their own behaviour. Indeed many believe that these variables may represent the new leverage points for instituting changes. Thus when they look into their organisations for help in the people area they are neither attracted to selection, testing, job analysis etc, nor the methods psychologists tend to use."

According to Argyris (1976) the executives do not find the methods relevant to them and the problems they are interested in. Psychologists have lost the initiative in the assessment of human behaviour to the Business Schools who have largely shunned the psychological approach to selection because of its heavy emphasis on rigour, which is not appreciated by those in power in industry. Clearly the problem has arisen in part because of the lack of advocacy by psychologists of particular techniques and, as has been shown in the review of personality testing, non-psychologists seizing on a particular tool and misusing it.

It would seem then that the non action approach has been to the detriment of psychology. If the psychologist does nothing, a competing profession will fill the gap. What is needed is the advocacy of selection procedures to practitioners which will move industrial and organisational psychologists away from being solely research scientists into a real professional role.

Clinical psychologists have been far more successful in achieving this, despite very real problems with some methods they use. As Philips and Bierman (1981) say when talking about evaluation research in clinical psychology: "The average level of adequacy (of therapies) attained seems not to have changed much: many small studies contain so many flaws that they simply confuse the literature with unsound results." The main difference between clinical and industrial and organisational psychologists, apart from their focus of interest, is that the clinical psychologist is the practitioner whereas the industrial and organisational psychologist is still largely the advisor, or more commonly the research worker. This difference has even caused some clinical psychologists to desire to be registered separately from mainstream psychologists, presumably because of the latter's very different emphasis on scientific research rather than providing a professional service.

The only way selection methods in industry will improve is by industrial and organisational psychologists developing in a similar way, and carving a professional role for themselves through a more visible political profile.

A new approach by industrial and organisational psychologists might develop into psychologists being more regarded as the practitioners in industry as far as the selection of people for work is concerned. Until that time, however, it is important for psychologists to appreciate the problems of practitioners and use their professionalism to guide practitioners in the use of better methods, such as the work sample test, while at the same time time appreciating that in the area of personnel selection for example, random selection as advocated by Fine would be unacceptable. Joynson (1974) in a plea for greater attention to be paid to a layman's understanding of behaviour cites a G. K. Chesterton story.

"...... a man dreams of emulating the great explorers. One day he sets sail from the West Country and heads out into the Atlantic, confident that he is destined to discover an unknown land. For many weeks he wanders across the ocean buffeted by storms and uncertain of his position. At last a coastline comes into view; and as he approaches, he sees the towers and minarets of a strange civilisation. Greatly excited he makes his way ashore. To his astonishment, the natives speak English. He has landed at Brighton." Practical psychology attempts to use what laymen and practitioners already know but seem to have forgotten. In the case of personnel selection practitioners need to be reminded of the value of using selection methods that bear a relationship to the job applicants will eventually do. This would seem obvious but the evidence of the popularity of techniques which do not do this suggests that psychologists need to help practitioners to land at Brighton.

BIBLIOGRAPHY

ABMA J.S.

Programmed Instruction - Past,Present,Future; in E.H. Fleishman and A.R. Bass (ed.) Studies in Personnel and Industrial Psychology. Dorsey Press : Homewood Illinois 1974.

ADCOCK N.V.

Testing the Test: How adequate is the 16PF with a New Zealand student sample? The New Zealand Psychologist vol 3 no 1 1974.

AHERN E.

Handbook of personnel forms and records; American Management Association New York 1949.

ALKER H.A. OWEN D.W.

Biographical, trait, and behavioural sampling predictions of performance in a stressful life setting; Journal of Personality and Social Psychology vol 35 pp 717-23 1977.

ALVEY N.G.

GENSTAT : A General Statistical Program Rothhamstead Experimental Station October 1977.

ANASTASI A

Psychological Testing; Collier-Macmillan New York 1976.

ANDERSON C.W.

The relation between speaking times and decision in the employment interview. Journal of Applied Psychology vol 44 pp 267-268 1960.

ANNETT J.

Learning in Practice; in P.D. Warr (ed) Psychology at Work pp 76-96 1971.

ANSTEY E.

A 30 year follow up of the C.S.S.B. procedure, with lessons for the future Journal of Occupational Psychology vol 50 pp 149-159 1977.

ARGYRIS C

The applicability of Organisational Sociology Cambridge University Press Cambridge 1972.

ARGYRIS C

Problems and New Directions for Industrial Psychology; in Dunnette M.D. (ed.) Handbook of Industrial Psychology Rand McNally Chicago 1976.

ARMSTRONG J.S. SOELBERG P.

On the interpretation of Factor Analysis Psychological Bulletin vol 70 no 5 pp 361-372 1968.

ASH P. KROEKER L.P.

Personnel Selection, Classification and Placement Annual Review of Psychology vol 26 pp 481-507 1975.

BALMA M.J.

The concept of synthetic validity Personnel Psychology vol 12 pp 395-396 1959.

BANNISTER D. MAIR J.M.

The evaluation of personal constructs Academic Press New York 1968.

BARTLETT F.C.

Intelligence as a Social Problem Journal of Mental Science vol 93 pp 1-10 1947.

BAYNE R.

Can selection interviewing be improved? Journal of Occupational Psychology vol 50 pp 161-167 1977.

BELBIN E.

Applicable psychology and some national problems: A synopsis of the 1978 Myers Lecture Bulletin of the British Psychological Society vol 32 pp 241-244 1979.

BENNETT G.K. CRUIKSHANK R.M.

A summary of clerical tests Psychological Corporation New York 1949.

BINET A. SIMON T.

Methodes nouvelles pour la diagnostic du niveau intellectual des anormaux Annee psychologique vol 11 pp 191-244 1905.

BINGHAM W. VAN DYKE. MOORE B.V.

How to Interview Harper New York 1959.

BLANTZ F. GHISELLI E.E.

The mixed standard rating scale: A new rating system Personnel Psychology vol 25 pp 185-200 1972.

BLUM M.L. NAYLOR J.C.

Industrial Psychology Harper and Row New York 1968.

BONNEAU L.R.

An interview for selecting teachers Dissertation Abstracts vol 17 pp 537-538 1957.

BOUCHARD J.R.

Field Research Methods: Interviewing, Questionnaires, Participant Observation, Systematic Observation, Unobtrusive Measures; in M.D. Dunnette (ed.) Handbook of Industrial and Organisational Psychology pp 363-413 1976.

BRAY D.W. GRANT D.L.

The assessment center in the measurement of potential for business management Psychological Monographs: General and Applied vol 80 (5) whole no 625 1966.

BROWNING R.C.

Validity of reference ratings from previous employers Personnel Psychology vol 21 pp 389-393 1968.

BUCKOUT R. SHERMAN H. GOLDSMITH C.T. VITALE P.A.

The effects of variations in motion fidelity during training on simulated low altitude flight U.S Air Force Report AMRL-TDR-63-108 1963.

BULL P.

Should the 16 pf be used in Personnel Selection? The New Zealand Psychologist vol 3 no 1 pp 11-15 1974.

BURT C.L.

The factorial study of temperamental traits British Journal of Psychology vol 1 pp 178-202 1948.

BURT C.L.

The factors of the mind: An introduction to Factor Analysis in Psychology Macmillan: New York 1949.

CAMPION J.E.

Work sampling for personnel selection Journal of Applied Psychology vol 56 pp 40-44 1972.

CARLSON R.E.

The current status of judgemental techniques in industry. Paper presented at the symposium: Alternatives to paper and pencil personnel testing. University of Pittsburgh May 1972.

CARLTON S.T. BRAULT M.B.

In-Basket Scoring Manual Research Memorandum 71-13 Educational Testing Service Princeton New Jersey 1971.

CASCIO W.F.

Accuracy of verifiable biographical information blank responses Journal of Applied Psychology vol 60 pp 767-769 1975.

CASCIO W.F.

Turnover,biographical data, and fair employment practice Journal of Applied Psychology vol 61 pp 576-580 1976.

CARROLL S.J. NASH A.N.

Effectiveness of a forced choice reference check Personnel Administration vol 35 pp 42-46 1972.

CATTELL R.B.

A note on factor invariance and the identification of factors British Journal of Psychology vol 2 no 3 pp 134-138 1949.

CATTELL R.B.

The Scree test for the number of factors Multivariate Behavioural Research vol 1 no 2 pp 245-260 1966.

CATTELL R.B. EBER H.W. TATSUOKA M.M.

Handbook for the Sixteen Personality Factor Questionnaire (16PF) Institute for Personality and Ability Testing Champaign Illinois 1970.

CHAPANIS A. LINDENBAUM L.E.

A reaction time study of four control-display linkages Human Factors vol 1 pp 1-7 1959.

CHOPPIN B.H.L. ORR L. KURLE S.D.M. FARA P. JAMES G.

The Prediction of Academic Success National Foundation for Educational research in England and Wales 1973.

COHEN I.S.

Programmed Learning and the Socratic Dialogue American Pychologist vol 17 pp 772-775 1962.

COHEN J. LEFKOWITZ J.

Development of a biographical inventory blank to predict faking on personality tests Journal of Applied Psychology vol 59 pp 404-405 1974.

COLBECK L.

Validation of Trainability tests: Report on 1973/75 research project (Ref 1974/75 R2); Knitting Lace and Net Industry Training Board London 1976.

COOK T.D. CAMBELL D.T.

The design and conduct of Quasi-Experiments and True Experiments in field settings in M.D. Dunnette (ed.) Handbook of Industrial and Organisational Psychology Rand McNally Chicago 1976.

CORLETT E.N. SALVENDY G. SEYMOUR W.D.

Selecting operators for fine manual tasks: A study of the O'Connor finger dexterity test and the Purdue Pegboard Occupational Psychology vol 45 pp 57-65 1971.

CRONBACH L.J.

Essentials of Psychological Testing Harper and Row, New York 1970.

CUMMIN P.C.

T.A.T. correlates of executive performance Journal of Applied Psychology vol 51 pp 78-81 1967.

DOWNS S.

Selecting the older trainee: A pilot study of trainabilty tests National Institute of Industrial Psychology Bullettin pp19-26 1968.

DOWNS S.

Personal communication 1970.

DOWNS S.

Trainabilty Assessments: Fork truck operators Industrial Training Research Unit, Cambridge 1972.

DOWNS S.

Trainabilty Assessments: Sewing machinists Industrial Training Research Unit, Cambridge 1973.

DOWNS S.

Trainability Testing: A practical approach to selection Training Information Paper no 11 H.M.S.O. 1977.

DREW G.C. COLQUHOUN W.P. LONG H.A.

Effect of small doses of alcohol on a skill resembling driving British Medical Journal vol 5103 pp 993-999 1958.

DUCKWORTH D.H.

Toward a psychological science that can be applied Bulletin of the British Psychological Society vol 34 pp 237-240 1981.

DUNNETTE M.D.

Personnel Management Annual Review of Psychology vol 13 pp285-314 1962.

DUNNETTE M.D.

A modified model for test validation and selection research Journal of Applied Psychology vol 47 pp 317-323 1963.

DUNNETTE M.D. BORMAN W.

Personnel Selection and Classification Systems Annual Review of Psychology vol 30 pp 477-526 1979.

EDWARDS A.E.

Techniques of attitude scale construction Appleton-Century-Crofts, New York 1957.

ELLIOT C.D.

Personality factors and scholastic attainments British Journal of Educational Psychology vol 42 pp 23-32 1972.

ENTWISTLE N.J.

Aptitude tests for higher education? British Journal of Educational Psychology vol 44 pp 92-96 1974.

ENTWISTLE N.J. BRENNAN T.

The academic performance of students: Two types of successful students British Journal of Educational Psychology vol 41 pp 268-76 1971.

ENTWISTLE N.J. NISBET J. ENTWISTLE D. COWELL M.D.

The academic performance of students: 1- Prediction from scales of motivation and study methods British Journal of Educational Psychology vol 42 pp 23-32 1972.

EVANS M.G. DERNER J

What does the least preferred co-worker scale really measure? A cognitive interpretetion Journal of Applied Psychology vol 59 pp 202-206 1974.

EYSENCK H.J. EYSENCK S.B.G.

Manual of the Eysenck personality inventory University of London Press 1964.

FERGUSON L.W.

The development of industrial psychology in B.H. Gilmer (ed) Industrial Psychology McGraw Hill New York 1961.

FIEDLER F.E.

A method of objective quantification of certain countertransference attitudes Journal of Clinical Psychology vol 7 pp 101-107 1951.

FIEDLER F.E.

A theory of leadership effectiveness New York: McGraw Hill 1967.

FIEDLER F.E. CHEMERS M.M. MAHAR L.

Improving Leadership Effectiveness: The Leader Match Concept Wiley New York 1976.

FINE S.A.

What's wrong with the hiring system? Organisational Dynamics vol 4 pp 55-67 1975.

FINKLE R.B.

Managerial Assessment Centres in M.D Dunnette (ed) Handbook of Industrial and Organisational Psychology Rand McNally Chicago 1976.

FLEISHMAN E.A. HARRIS E.E. BURTT H.E.

Leadership and supervision in industry: an evaluation of a supervisory training program Bureau of Educational Research Monographs no 33 1955.

FLEISHMAN E.A.

The description and prediction of perceptual-motor skill learning in R. Glaser (ed) Training Research and Education University of Pittsburgh Press Pittsburgh 1962.

FREDERIKSEN N. JENSEN O. BEATON A.E.

Prediction of Organisational Behaviour Pergamon New York 1972.

FREDERIKSEN N.

Factors in In-Basket Performance Psychological Monographs vol 76 (22) whole no 541 1962.

FREDERIKSEN N. SAUNDERS D.R. WAND B.

The in-basket test Psychological Monographs vol 71 (9) whole no 438 1957.

GHISELLI E.E. BROWN C.W.

Personnel and Industrial Psychology McGraw Hill New York 1955.

GHISELLI E.E.

The validity of occupational aptitude tests Wiley New York 1966.

GHISELLI E.E.

The validity of aptitude tests in personnel selection Personnel Psychology vol 26 pp 461-477 1973.

GIBSON G.W.

A new dimension for 'In-basket' training Personnel vol 38 pp 76-79 1961.

GILL R.W.T.

Assessing Management Potential: A New look at the In-Tray Exercise Paper presented at the 11th Annual Occupational Psychology Conference of the British Psychological Society January 1978.

GILL R.W.T.

The in-tray (in-basket) exercise as a measure of management potential Journal of Occupational Psychology vol 52 pp 185-197 1979.

GLENNON J.R. ALBRIGHT L.E. OWENS W.A.

A Catalog of Life History Items Greenville NC Creativity Institute Richardson Foundation 1966.

GOHEEN H.W. MOSEL J.N.

Validity of the employment recommendation questionnaire: 2 Comparison with field investigation Personnel Psychology vol 12 pp 297-301 1959.

GOLDSMITH D.B.

The use of the personal history blank as a salesmanship test Journal of Applied Psychology vol 6 pp 149-155 1922.

GORDON L.V.

Manuals- Gordon Personal Profile and Gordon Personal Inventory Harcourt Brace New York 1963.

GORSUCH R.L.

Factor Analysis Saunders London 1974.

GOUGH H.G.

Clinical versus Statistical prediction in Psychology in L. Postman (ed) Psychology in the Making Knopf New York 1962.

GRANT D.L. KATKOVSKY W. BRAY D.W.

Contributions of projective techniques to assessment of management potential Journal of Applied Psychology vol 51 pp 226-232 1967.

GREEN S.G. NEBEKER D.M.

The effects of situational factors and leadership style on leader behaviour Organisational Behaviour and Human Performance vol 19 pp 368-377 1977.

GREENWOOD J.M. MCNAMARA W.J.

Interater reliabilty in situational tests Journal of Applied Psychology vol 31 pp 101-106 1967.

GUILFORD J.P.

Psychometric methods McGraw Hill New York 1954.

GUILFORD J.P.

Personality McGraw Hill New York 1959.

GUION R.M.

Personnel Testing McGraw Hill New York 1965.

GUION R.M. GOTIER R.F.

Validity of Personality measures in personnel selection Personnel Psychology vol 18 pp 135-164 1965.

GUTTMAN L.

A basis for Analysing test-retest reliabilty Psychometrika vol 10 no 4 pp 255-282 1945.

HAKEL M.D. DOBMEYER T.W. DUNNETTE M.D.

Relative importance of three content dimensions in overall suitability ratings of job applicants ratings. Journal of Applied Psychology vol 54 pp 65-71 1970.

HARRIS J.G. jr.

Judgemental versus mathematical prediction: an investigation by analogy of the clinical versus statistical controversy Behavioural Science vol 8 pp 324-335 1963.

HARRIS M.L. HARRIS C.W.

A factor analytic interpretation strategy Educational and Psychological Measurement vol 31 no 3 pp 589-601 1971.

HEBB D.O.

The Organisation of Behaviour Wiley New York 1949.

HERRIOT P.

Towards an attributional theory of the selection interview Journal of Occupational Psychology vol 54 pp 165-173 1981.

HEMPHILL J.K. GRIFFITHS D.E. FREDERIKSEN N.

Administrative Performance and Personality Bureau of Publications Teachers College Press Columbia University New York 1962.

HESKETH B.

Survey on Testing in Industry New Zealand Institute of Personnel Management 1974.

HINES M. O'CONNOR J.

A Measure of Finger Dexterity Personnel Journal vol 4 pp 379-382 1926.

HINRICHS J. HAANPERA S. SONKIN L.

Validity of a biographical information blank across national boundaries Personnel Psychology vol 29 pp 417-421 1976.

HOGAN D

Apprentice selection in the Electrical Supply Industry Unpublished report for the Electricity Supply Industry Training Board; Industrial Training Research Unit Cambridge, 1974.

HOGAN R. DESOTO C.B. SOLANO C.

Traits, tests, and personality research American Psychologist vol 32 pp 255-264 1977.

HOLDSWORTH R.F.

The role of the assessment centre Paper read at the National Conference of the Institute of Personnel Management Harrogate 1973.

HOLT H.O.

An exploratory study in the use of a self-selection instruction program in basic electricity in J.L. Hughes (ed.) Programmed Learning: A critical evaluation Educational Methods Chicago 1963.

HORN J.L.

On subjectivity in factor analysis Educational and Psychological Measurement vol 27 no 4 pp 811-817 1967.

HOWELL W.C.

Essentials of Industrial and Organisational Psychology Dorsey, Homewood 1976.

HUDSON L

Contrary Imaginations Penguin London 1962.

HULL C.H. NIE N.H.

S.P.S.S. Update 7-9 McGraw Hill New York 1981.

HUMAN RIGHTS COMMISSION ACT

Government Printer Wellington New Zealand 1977.

JACKSON D.N. PAUNONEN S.V.

Personality Structure and Assessment Annual Review of Psychology vol 31 pp 503-551 1980.

JAMES W

The Principles of Psychology Dover New York 1950.

JENKINS W.C.

The tactual discrimination of shapes of coding aircraft type controls, in P.M. Fitts (ed.) Psychological research on equipment design U.S. Government Printing Office Washington D.C. 1947.

JOYNSON R.B.

Psychology and Common Sense Routledge and Kegan Paul London 1974.

KAISER H.F.

Image Analysis in Chester W Harris (ed.) Problems in Measuring Change University of Wisconsin Press Madison 1963.

KEENAN A. WEDDERBURN A.A.I.

Putting the boot on the other foot: Candidates' descriptions of interviewers Journal of Occupational Psychology vol 53 pp 81-89 1980.

KELLY E.L. FISKE D.W.

The prediction of performance in clinical psychology University of Michigan Press Ann Arbor Michigan 1951.

KELLY G.A.

The Psychology of Personal Constructs New York Norton 1955.

KERLINGER F.N. PEDHAZUR E.J.

Multiple Regression in Behavioural Research Holt Rinehart and Winston New York 1973.

KINSLINGER H.J.

Application of projective techniques in personnel psychology since 1940 Psychological Bulletin vol 66 pp 134-149 1966.

LAFITTE P

Melbourne Test 90 Australian Journal of Psychology Monograph supplement no 1 1954.

LANDY F.J.

The validity of the interview in police officer selection Journal of Applied Psychology vol 61 pp 193-198 1976.

LANDY F.J. TRUMBO D.A.

Psychology of Work Behaviour Dorsey Press Homewood Illinois 1980.

LATHAM G.P. PURSELL E.D.

Measuring absenteeism from the opposite side of the coin. Journal of Applied Psychology vol 60 pp 369-371 1975.

LAWSHE C.H.

Employee Selection Personnel Psychology vol 5 pp 31-34 1952.

LAWSHE C.H. BALMA M.J.

Principles of Personnel Testing McGraw Hill New York 1966.

LIPSITT L. ROGERS F.P. KENTNER H.M.

Personnel Selection and Recruitment Allyn and Bacon Boston 1964.

LOPEZ F.M.

Evaluating executive decision making: The in-basket technique A.M.A. Research Study 75; American Management Association 1966.

MACKINON D.W.

An overview of assessment centres Center for Creative Leadership Technical Report no 1 1975.

MASLOW A.H.

A theory of Motivation Psychological Review vol 50 pp 370-396 1943.

MAYFIELD E.C.

The selection interview: A re-evaluation of published research. Personnel Psychology vol 17 pp 239-260 1964.

MCNEMAR Q.

The factors in factoring behaviour Psychometrika vol 16 pp 353-370 1951.

MCORMICK E.J.

Human Factors in Engineering and Design McGraw Hill New York 1976.

MEEHL P.E.

Clinical versus Statistical Prediction: A Theoretical Analysis and a Review of the Evidence University of Minnesota Press Minneapolis 1954.

MEEHL P.E.

When shall we use our heads instead of the formula? Journal of Counselling Psychology vol 4 pp 268-273 1957.

MEEHL P.E.

Seer over sign: the first good example Journal of Experimental Research in Personality vol 1 pp 27-32 1965.

MEYER H.H.

The validity of the in-basket test as a measure of managerial performance Personnel Psychology vol 23 pp 299-307 1970.

MEYER J.P. PEPPER S.

Need compatibility and marital adjustment in young married couples Journal of Personality and Social Psychology vol 35 pp 331-342 1977.

MILLER G.A.

The magical number seven, plus or minus two: Some limits on our capacity for processing information Psychological Review vol 63 pp 81-97 1956.

MILLER J. ROWE P.M.

Influence of favourable and unfavourable information on assessment decisions Journal of Applied Psychology vol 51 pp 432-435 1967.

MINTZBERG H.

The Nature of Managerial Work Harper and Row New York 1973.

MOSEL J.N. GOHEEN H.W.

The validity of the employment recommendation questionnaire in personnel selection: 1 The skilled trades Personnel Psychology vol 11 pp 481-490 1958.

MOSEL J.N. GOHEEN H.W.

The validity of the employment recommendation questionnaire in personnel selection: 3 Validity of different types of references Personnel Psychology vol 12 pp 469-477 1959.

MOUNT M.K. MUCHINSKY P.M. HANSER L.M.

The predictive validity of a work sample: A laboratory study Personnel Psychology vol 30 pp 637-645 1977.

MURRELL K.F.H.

Ergonomics Chapman and Hall London 1965.

MYERS J.H. ERRETT W.

The problem of preselection in weighted application blank studies Journal of Applied Psychology vol 43 pp 94-95 1959.

MUCHINSKY P.M.

Utility of work samples in complying with E.E.O.C. guidelines Personnel Journal vol 54 pp 218-220 1975.

MUCHINSKY P.M.

The use of reference reports in personnel selection: A review and evaluation Journal of Occupational Psychology vol 52 pp 287-297 1979.

NASH A.N. MUCZYK J.P. VITTORI F.L.

The relative practical effectiveness of programmed instruction. Personnel Psychology vol 24 pp 397-418 1971.

NASH J.C. SHINE L.C.

A table for determining the increase in mean criterion score obtained by using a selection device Journal of Industrial Psychology vol 3 pp 33-42 1965.

NIE N.H HADLAI HULL C. JENKINS J. STEINBRENNER K. BENT D.H.

Statistical package for the Social Sciences McGraw Hill New York 1975.

NOVICK M.R. LEWIS C.

Coefficient Alpha and the Reliability of Composite Measurements Psychometrika vol 32 pp 1-18 1966.

O'DELL J.W.

Method for detecting random answers on personality questionnaires Journal of Applied Psychology vol 55 no 4 pp 380-383 1971.

OVERALL J.E. KLETT J.C.

Applied Multivariate Analysis McGraw Hill New York 1972.

OWENS W.A.

Background Data in M.D. Dunnette (ed.) Handbook of Industrial Psychology Rand McNally New York 1976.

PALMER W.

Management effectiveness as a function of personality traits of the manager Personnel Psychology vol 27 pp 283-295 1974.

PEARN M.A.

C.R.A.M.P.- A training design algorithm Industrial Training Research Unit Cambridge 1970.

PEARN M.A.

Race relations and the role of the occupational psychologist Bulletin of the British Psychological Society vol 29 pp 300-302 1976.

PHILLIPS J.S. BIERMAN K.L.

Clinical Psychology: Individual Methods Annual Review of Psychology vol 32 pp 405-438 1981.

PILKINGTON G.W. HARRISON G.J.

The relative value of two high level intelligence tests, advanced level and first year university marks for predicting degree classification British Journal of Educational Psychology vol 37 pp 382-389 1967.

PINNEAU S.R. NEWHOUSE A.

Measures of invariance and comparibility in factor analysis for fixed variables Psychometrika vol 29 no 3 pp 271-282 1964.

PLAG J.A.

Some considerations of the value of the psychiatric screening interview. Journal of Clinical Psychology vol 17 pp 3-8 1961.

POND D

Psychology Prop or Profession? Bulletin of the British Psychological Society vol 35 pp 49-55 1982.

PRIEN E.P.

Assessment of higher level personnel: 5 An analysis of interviewer's predictions of job performance. Personnel Psychology vol 15 pp 319-334 1962.

PSYCHOLOGICAL CORPORATION

Minnesota Clerical Test Psychological Corporation New York 1947.

POWELL J.L.

Selection for University in Scotland Publications of the Scottish Council for Education University of London Press London 1973.

PRESSEY S.L.

A simple apparatus which gives tests and scores - and teaches in A.A. Lumsdaine and R. Glaser (eds.) Teaching Machines and Programmed Learning: A Source Book National Education Association 1960.

PRIMOFF E.S.

Job Element methods volume 3: The J-coefficient Personnel Research and Development Center; U.S. Civil Service Commission 1975.

RAINES G.N. ROHRER J.H.

The operational matrix of psychiatric practice: 1 Consistency and variability in interview impressions of different psychiatrists American Journal of Psychiatry vol 111 pp 721-733 1955.

RAND T.M. WEXLEY K.N.

Demonstration of the effect "Similar to me" in simulated employment interviews Psychological Reports vol 36 pp 535-544 1975.

ROACH D.E.

Double cross-validation of a weighted application blank over time Journal of Applied Psychology vol 55 pp 157-160 1971.

ROBERTSON I. DOWNS S.

Learning and the Prediction of Performance: Development of Trainability Assessments in the United Kingdom Journal of Applied Psychology vol 64 no 1 pp 42-50 1979.

RODGER A.

The worthwhileness of the interview Occupational Psychology vol 26 pp 101-106 1952.

ROTHE H.F. NYE C.T.

Output rates among machine operators: 2- Consistency related to methods of pay Journal of Applied Psychology vol 43 pp 417-420 1959.

ROWE P.M.

Order effects in assessment decisions Journal of Applied Psychology vol 51 pp 170-173 1967.

SANFORD R.N.

Clinical and actuarial prediction in a setting of action research Proceedings of the 1955 Invitational Conference on Testing Problems Educational Testing Service Princeton New Jersey 1956.

SASHKIN M. TAYLOR F.C. TRIPATHI R.C.

An analysis of situational moderating effects on relationships between least preferred co-worker and other psychological measures Journal of Applied Psychology vol 59 pp 731-740 1974.

SAWYER J.

Measurement and prediction, clinical and statistical Psychological Bulletin vol 66 pp 178-200 1966.

SCHMIDT F.L. GREENTHAL A.L. HUNTER J.E. BERNER J.G. SEATON F.W.

Job sample vs paper and pencil trades and technical tests: adverse impact and examinee attitudes Personnel Psychology vol 30 pp 187-197 1977.

SCHMITT N.

Social and situational determinants of interview decisions: Implications for the employment interview Personnel Psychology vol 29 pp 79-101 1976.

SCHIER C.F.

The contingency model of leadership: An extension of emergent leadership and leader's sex Organisational Behaviour and Human Performance vol 21 pp 220-239 1978.

SCOTT W.D. CLOTHIER R.C. SPRIEGEL W.R.

Personnel Management McGraw Hill New York 1961.

SHAW J.

The function of the interview in determining fitness for teacher training Journal of Educational Research vol 45 pp 667-681 1952.

SHOUKSMITH G.A.

Assessment through Interviewing Pergamon Oxford 1978

SIEGEL S.

Non parametric Statistics for the Behavioural Sciences McGraw Hill New York 1956.

SIMON H.A.

The Sciences of the Artificial M.A.:M.I.T. Press Cambridge 1969.

SKINNER B.F.

The Science of Learning and the Art of Teaching Harvard Educational Review vol 24 pp 86-97 1954.

SMITH M.C.

An attempt to predict apprentice performance in the Electrical Supply Industry using the 16 Personality Factor Questionnaire Unpublished Honours thesis; University of Wales Institute of Science and Technology, Cardiff 1968.

SMITH M.C.

Trainability Assessments: Electronic Assemblers Industrial Training Research Unit; Cambridge England 1972.

SMITH M.C.

Clerical Tests for the Trustee Savings Banks Trustee Savings Banks London 1974.

SMITH M.C.

How to handle interviews Where vol 12 pp 50-53 1976.

SMITH M.C.

A comparison of the value of trainability assessments and other tests for predicting the practical performance of dental students International Review of Applied Psychology vol 25 pp 125-130 1977.

SMITH M.C. DOWNS S.

Trainability assessments for apprentice selection in shipbuilding Journal of Occupational Psychology vol 48 pp 39-43 1975.

SMITH P.C. KENDALL L.M.

Retranslation of expectations: An approach to the construction of unambiguous anchors for rating scales Journal of Applied Psychology vol 47 pp 149-155 1963.

SOLOMON R.L.

An extension to control group design Psychological Bulletin vol 46 pp 137-150 1949.

SPRIEGEL W.R. JAMES V.A.

Trends in recruitment and selection practices Personnel vol 35 no 3 pp 42-48 1958.

SPRINGBETT B.M.

Factors affecting the final decision in the employment interview Canadian Journal of Psychology vol 12 pp 13-22 1958.

STEWART A. STEWART V.

Tomorrow's Men Today Institute of Personnel Management/ Institute of Manpower Studies 1976.

STERNBERG J.J.

An analytical study of a selection interview procedure Unpublished Master's thesis Syracuse University 1950.

STRUPP H.H. WILLIAMS J.V.

Some determinants of clinical evaluation of different psychiatrists American Medical Association Archives of General Psychiatry vol 2 pp 434-440 1960.

TAYLOR H.C. RUSSEL J.T.

The relationship of validity coefficients to the practical effectiveness of tests in selection: Discussion and tables Journal of Applied Psychology vol 23 pp 565-578 1939.

THOMSON H.A.

A comparison of predictor and criterion judgements of managerial performance using the multi-trait multi-method approach Journal of Applied Psychology vol 54 pp 496-502 1970.

THURSTONE L.L.

Multiple Factor Analysis University of Chicago Press Chicago 1947.

TIFFIN J.

Purdue Pegboard Examiner Manual Science Research Associates Chicago Illinois 1948.

TUCKER L.R.

A method for synthesis of Factor Analysis Studies Personnel Research Section Report no 984 Washington D.C. department of the Army 1951.

TUCKER L.R. KOOPMAN R.F. LINN R.L.

Evaluation of Factor Analytic research procedures by means of simulated correlation matrices Psychometrika vol 34 pp 421-434 1969.

ULRICH L. TRUMBO D.

The selection interview since 1949 Psychological Bulletin vol 63 pp 100-116 1965.

UNGERSON B.

Assessment centres - A review of research findings Personnel Review vol 3 no 3 pp 4-13 1974.

VON NEUMANN J. MORGENSTERN O.

Theory of games and economic behaviour Princeton University Press Princeton 1947.

WAGNER R.

The employment interview: A critical review Personnel Psychology vol 2 pp 17-46 1949.

WAHBA M.A. BRIDWELL L.B.

Maslow reconsidered: A review of research on the need hierarchy theory Organisational Behaviour and Human Performance vol 18 pp 78-97 1977.

WAINER H.A. RUBIN I.M.

Motivation of research and development entrepreneurs Journal of Applied Psychology vol 53 pp 178-184 1969.

WALD A.

Statistical Decision Functions Wiley New York 1950.

WALLIS D.

Sex discrimination and the law Bulletin of the British Psychological Society vol 33 pp 1-5 1980.

WEBSTER E.C.

Decision Making and the Employment Interview Eagle Montreal 1964.

WEINER J.S. MAULE H.G.

Human Factors in Work Design and Production Taylor and Francis London 1977.

WERNIMONT P.F. CAMBELL J.P.

Signs Samples and Criteria Journal of Applied Psychology vol 52 pp372-376 1968.

WEXLEY K.N. NEMEROFF W.F.

Effects of racial prejudice, race of applicant and biographical similarity on interviewer evaluations of job applicants Journal of Social and Behavioural Sciences vol 20 pp 66-78 1974.

WEXLEY N.W. YUKL G.A.

Organisational Behaviour and Personnel Psychology Richard D. Irwin inc. Homewood Illinois 1977.

WEXLEY K.N. YUKL G.A. KOVACS S. SANDERS R.

The importance of contrast effects in employment interviews Journal of Applied Psychology vol 56 pp 45-48 1972.

WRIGHT O.R. jr.

Summary of research on the selection interview since 1964 Personnel Psychology vol 22 pp 391-413 1969.

WHYTE W.H.

The Organisation Man Jonathan Cape London 1957.

WIGGINS J.S.

Personality and Prediction Addison Wesley 1973.

WOLLOWICK H.B. MCNAMARA W.J.

Relationship of the components of an assessment centre to management success Journal of Applied Psychology vol 53 pp 348-352 1969.

WOODWARD J.

Management and Technology Her Majesty's Stationery Office London 1958.

WRIGLEY C.S. NEUHAUS J.O.

The matching of two sets of factors American Psychologist vol 10 pp 418-429 1955.

ZACCARIA M.A. DAILEY J.T. TUPES E.C. STAFFORD A.R. LAWRENCE H.G. AILSWORTH K.A.

Development of an interview procedure for U.S.A.F. officer applicants _United States Air Force Personnel and Training Research Center Development Report_ no TN-56-43 1956.

ZANGWILL O.L.

An Introduction to Modern Psychology Methuen London 1950.

ZAVALA A.

Development of the forced choice rating scale technique _Psychological Bulletin_ vol 63 pp 117-124 1965.

Plasto (N.Z.) Ltd. Fact Sheet

Plasto (N.Z.) Ltd employs 2,000 people in the central North Island city of Trafalgar. Plasto makes plastic products of all kinds from buckets through to high quality plastic moulding for hi-fi equipment. The plant at Trafalgar is new and has only been in full operation for two years. You are A.P. Allen, personnel manager of the company, and you have just returned from two weeks in hospital for surgery. The time of this exercise is 9.00 a.m., July 1st. The calendar for the month is shown in the illustration:

July

S	M	T	W	T	F	S
-	-	-	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	-

The plastics business is fairly volatile. In recent years the production technology and marketing changes have been fairly fast and companies like Plasto have had to invest in plant and choose products for production carefully to remain profitable.

The plant is unionized by the plastic workers. The union is quiet and businesslike and rarely makes a fuss to impress the members. But when it decides to make a move it means business and often can get its own way.

The company philosophy is somewhere between centralization and decentralization. For example, some functions are centralized - researching and production. Other functions such as sales and operations are decentralized and a good deal of power is given to the section. Personnel is a split function - partially centralized (policy), partly decentralized (implementation of policy).

Plasto's goals are not explicitly stated. The company must make a profit for its shareholders. It seems to wish to increase its market share through increased exports. Its slogan is "Plasto: the socially responsible company". What that means is arguable.

Different members of the Union executive and management have many divergent views as to its meaning.

The organizational chart for the company is given on Information Sheet 1.

As Allen, you possess a degree in business administration and have been in the job for two years. You are 35 years old, a New Zealand citizen and unmarried. Your section consists of the following people. The descriptions are thumbnail sketches taken from the files of the company.

Ms M.D. Myers: Denise Myers is unmarried, a graduate in psychology aged 30. She has academic research experience.

Mr A. Lowe : Training Officer: Ted Lowe is a graduate in psychology. He is 25 years of age and this is his first job.

Mr K.D. Wells: Industrial Relations Officer: Kelvin Wells did not go to university but does have a wide experience of the plastic industry based on supervisory job in another plastics company.

On your return you notice that you desk has the following items on it. Work your way through all the items and answer the questions at the end of each one.

APPENDIX 2

MASSEY UNIVERSITY

DEPARTMENT OF PSYCHOLOGY

JOB DESCRIPTION PLASTO (N.Z.) LTD

Job Title - Personnel Manager

Department - Under the general supervision of the managing director and general manager, the personnel manager is responsible for all factors that relate to the employees in the company such as training, recruitment, industrial relations, wages and salaries welfare etc. The personnel manager works in accordance with general, special, and legal directives, but exercises independent judgment in directing activities. Work is subject to review by the General Manager or his deputy through conferences, reports and operating results achieved.

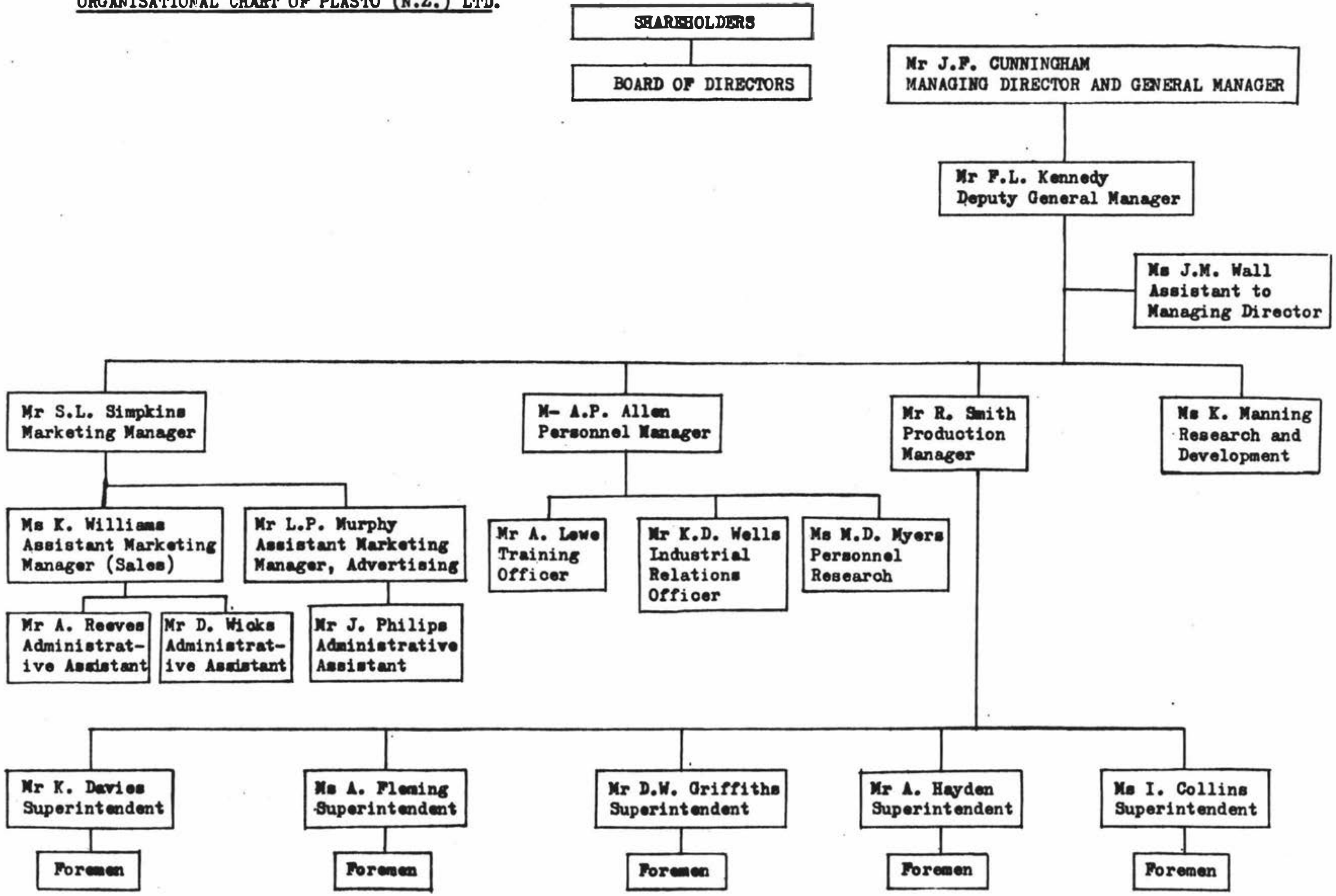
Regular Duties

1. Directs and controls the personnel operations of the company. Advises and consults with subordinates regarding such activities.

2. Monitors the work of other workers directly under him.

3. Carefully maintains the philosophy of his company which is to be as democratic as possible and wherever possible to achieve results through consensus rather than dictation. The personnel manager is obviously also concerned with social responsibility, but has problems in actually implementing the principle.

ORGANISATIONAL CHART OF PLASTO (N.Z.) LTD.



APPENDIX 4

ITEM 1 NEW ZEALAND INSTITUTE OF MANAGEMENT

MATATANE BRANCH

P.O. BOX 65

MATATANE

June 29th

Dear Mr Allen,

Mr J.P. Vickers of the Trafalgar Rotory Club told me of some of the interesting work 'Plasto' have been doing in the area of semi-skilled operator selection. The workers of New Zealand Institute of Management here in Matatane would be really pleased to hear of your company's progress in this area. I was therefore wondering if you would agree to come along one Wednesday night and give our members a talk?

Yours sincerely
Kev Walters

A.K. Walters
(Secretary)

Action 1. What I will do?

ITEM 2

INTER OFFICE MEMO

PLASTO (NZ) LTD

TO: M A P Allen June 24th

FROM: Kelvin Wells

SUBJECT: Job Transfer

I feel that I have contributed all I can to my present job. I believe that as it is presently structured I can no longer grow as a person. I hereby request a transfer from this job or a major restructuring of the present job.

ACTION 1. What I will do

ITEM 3 INTER OFFICE MEMO JULY 1st

PLASTO (NZ) LTD

TO: M A P Allen

FROM: Mr R Smith c.c. Mr F L Kennedy
Mr J F Cunningham

It has increasingly, come to my notice that since we abandoned 'clocking in' more and more employees are turning up four and five minutes late in the morning. I have asked my superintendents to crack down on this. We really do need an increase in productivity. Can you think of anything else that may help?

ACTION 1 What I will do:

ITEM 4

The Spastics Society
P O Box 5672
AUCKLAND

JUNE 25th

Dear Sir,

We are writing to ask you if you would allow us to conduct a collection for the society in your factory on some convenient date in August. Although we have no direct evidence as yet as we believe that an appeal in a factory is far more successful than a house collection. Naturally we would not want to disrupt production but your cooperation would be appreciated.

Yours faithfully

G H Roberts
Secretary

ACTION 1 What I will do:

ITEM 5 WHILE YOU WERE OUT

DATE 27/6 TIME 9.00 a.m.

NAME: J F Cunningham

Telephoned.

SIGNED

ACTION 1 What I will do:

ITEM 6 INTER OFFICE MEMO

Plasto (NZ) Ltd

TO: M A P Allen June 31st

FROM: J M Wall

SUBJECT: Consultants report on job design

The preliminary results from the consultants report suggest that we really need to do something about 'enriching' the jobs in certain sections of the plant. Before the full report is made available it might be useful if you pinpoint the jobs which in your view are the most in need of redesign.

ACTION 1 What I will do:

ITEM 7

INTER OFFICE MEMO

PLASTO (NZ) LTD

TO: M A P ALLEN June 27th

FROM: Mr R Smith

As you asked on June 11th I have completed the performance evaluations on my five superintendents. Using the forced distribution system you suggested my overall ratings are as follows

Above Average	Ms A Fleming
Average	Mr A Hayden
Average	Ms I Collins
Average	Mr D W Griffiths
Below Average	Mr K Davies

ACTION 1 What I will do:

ITEM 8 INTER OFFICE MEMO

TO: M A P Allen June 30th

FROM: Mr Kevin Wells

SUBJECT: UNION DEMANDS

I have just heard indirectly that the union as a whole plans to ask for a 12% increase in pensions and fringe benefits.

How are we going to handle this demand?

ACTION 1 What I will do:

ITEM 9

Association for Racial Equality
WELLINGTON

June 27th

Dear Sir or Madam,

We have information which indicates that you are using selection tests designed for the 'pakeha' population. Most tests of this sort used for selection discriminate against Maoris. As a department we feel you should discontinue the use of such tests unless you can prove their validity and show they do not discriminate.

Yours faithfully

I R McDonald
Under-Secretary

ACTION 1 What I will do:

ITEM 10 INTER OFFICE MEMO

PLASTO (NZ) LTD

TO: M A P Allen July 1st

FROM: Mr L P Murphy

On July 20th we are filming some advertisements for our new line of watering cans. In this series we want to get some workmen to talk about making them. Can you suggest anyone who might be suitable?

ACTION 1 What I will do:

ITEM 11 INTER OFFICE MEMO

PLASTO (NZ) LTD

CONFIDENTIAL

TO: M A P Allen

FROM: Ms K Manning

We have strong evidence in this department that some of our ideas are being 'copied' by rivals. What do you suggest we should do?

ACTION 1 What I will do:

ITEM 12 INTER OFFICE MEMO

PLASTO (NZ) LTD

TO: All Managers June 28th

FROM: J F Cunningham

We have been asked by the local council for our views about a relief road around Trafalgar. I would be grateful for the views of your department and for any suggestions about how we could obtain a fair representation of all the factory employees.

ACTION 1 What I will do:

ITEM 13

Trafalgar Chamber of Commerce
P O Box 2169
TRAFALGAR

June 28th

Dear Mr Allen,

You have been so helpful with our past meetings that I have come back again. We'd like you to be part of a panel on "Selecting Employees - the do's and don't's".

You would be asked to speak for 20 minutes and then answer questions with the rest of the panel.

The meeting will be at the George Hotel on July 16th at 2 p.m.

Yours sincerely,

Jim Copeman
Chairman

ACTION 1 What I will do:

ITEM 14

WHILE YOU WERE OUT

DATE: June 24

NAME: Mr K Davies

Telephoned

ACTION 1 What I will do:

ITEM 15 INTER OFFICE MEMO

PLASTO (NZ) LTD

TO: M A P Allen June 23

FROM: Mr D W Griffiths

SUBJECT: Pre-retirement Clinic

Recently in chatting with some of the older employees, I've had some requests for pre-retirement clinics. It seems that other companies in New Zealand run them, N.A.C. are an example.

I have no idea of the costs involved, but I wondered if the idea was worth further investigation.

ACTION 1 What I will do:

ITEM 16

Union of Plastic Workers,
Trafalgar Branch,
P O Box 742,
TRAFALGAR.

June 28th

Dear Mr Allen,

We request a formal meeting with you concerning the increased accident rates in the extruding shop. It occurs to us that if nothing can be done about the dangers of working in this shop, increased payment in the form of danger money is called for. From our point of view, the afternoon of July 16th would be most suitable.

Yours sincerely,

R L Jones
Secretary

ACTION 1 What I will do:

ITEM 17 INTER OFFICE MEMO

PLASTO (NZ) LTD

TO: M A P Allen June 25th

FROM: Mr Ted Lowe

SUBJECT: Holidays

Instead of taking a week in October as I originally requested, can I now have a weeks holiday between the 27th and 31st July?

ACTION 1 What I will do:

ITEM 18 INTER OFFICE MEMO

PLASTO (NZ) LTD

TO: M A P Allen

FROM: Denise Myers

SUBJECT: Reorganisation of personnel department

You asked me to consult with the other members of the department regarding a proposed reorganisation of the personnel department. As I understand it, Mr F L Kennedy asked all department heads to consider this.

Basically, we believe the department to be understaffed. We feel there ought to be more appointments to take care of the daily interviewing load which prevents certain department members doing the jobs they have been allotted properly.

Mr Kennedy called me on June 25th and asked to expedite the report since he needs to take his recommendations on this to the next board.

ACTION 1 What I will do:

ITEM 19

New Zealand Director & Executive,
P O Box 921,
CHRISTCHURCH.

June 23rd

Dear Sir/Madam,

Enclosed, please find the postage paid renewal card for "The New Zealand Director and Executive". We hope you will take this opportunity of renewing your subscription to what is the Reading Management publication in New Zealand.

Yours faithfully,

J P Davis
Subscription Manager

Encl:

ACTION 1 What I will do:

ITEM 20

Bank of Taupo,
P O Box 219,
TAUPO

June

Dear Mr Allen,

PLASTO (NZ) PENSION FUND

We have at last finalised arrangements for a pension fund for your company. Essentially to those who wish to contribute it would mean a deduction of 5% of their salary with a company contribution of 5%. Perhaps we should arrange a meeting to take the matter further.

Yours sincerely,

B Burroughs
Manager

ACTION 1 What I will do:

ITEM 21

INTER OFFICE MEMO

PLASTO (NZ) LTD

TO: M A P Allen June 24th

FROM: Denise Myers

SUBJECT: Evalution of Employees from superintendents down.

In an effort to develop something more acceptable to all employees at Plasto (NZ) Ltd. than the forced distribution system we currently use. I have done some research and communicated with people from other organisations.

More and more frequently, it appears that I am hearing the critical-incident technique. I've called a consultant, a Dr David West, who would like to come to talk to us about this as soon as we can. What do you think?

ACTION 1 What I will do:

ITEM 22

State Insurance,
WELLINGTON

June 28th

Dear Sir/Madam,

We have just made available a new form of insurance for your liability for the safety of your employees, fire, robbery all rolled into one, which will be much cheaper than separate policies in the long run. We are anxious to discuss the matter further with you and would like to send our representative round at 11 a.m. on July 14th if this is convenient.

Yours faithfully,

J R Shearer
General Manager

ACTION 1 What I will do:

ITEM 23

16 Roberts Street,
WELLINGTON.

June 26th

Dear Sir/Madam,

I recently came for an interview to Plasto for an administrative assistant's job in the Research and Development Department. I have been offered a position with another company but prefer the job described at Plasto. Could you please tell me as soon as possible whether I was successful or not.

Yours faithfully,

James Fallow

ACTION 1 What I will do:

ITEM 24

INTER OFFICE MEMO

PLASTO (NZ) LTD

TO: Mr A P Allen

FROM: Mr A Reeves

I would be grateful if I could see you as soon as possible to discuss my status in the company now that my wife has been convicted for theft.

ACTION 1 What I will do:

ITEM 25

INTER OFFICE MEMO

PLASTO (NZ) LTD

TO: M A P Allen

FROM: Mr F L Kenndey

SUBJECT: Employee Theft

One of your least pleasant duties is to try to help us reduce employee theft to equipment and materials. A stocktaking indicates an alarming increase in theft.

Past studies indicate that 65 percent of these thefts are due to employees and other 35 percent to outsiders such as vendors, or professional thieves.

Please have your recommendation on how to handle this problem (from the personnel departments point of view) on my desk in the next few weeks.

ACTION 1 What I will do:

ITEM 26

From J Jones,
Foreman,
Mixing Section.

Dear Mr Allen,

The cafeteria in this factory stinks. The food is poor and the prices are high. When are you going to provide adequate facilities or have we just got to carry on putting up with food which in my opinion, is not worth giving to a cat.

ACTION 1 What I will do:

ITEM 27

Audio Visual Aids Ltd.,
AUCKLAND.

June 25th

Dear Sir/Madam,

Enclosed is our current catalogue which is largely self explanatory. However, I would like to draw your attention to our new line of overhead projectors which through improved lens grinding have a definition unsurpassed by any other in the world.

Yours faithfully,

Jerome S Williams
(Sales Manager)

ACTION 1 What I will do:

ITEM 28

INTER OFFICE MEMO

PLASTO (NZ) LTD

TO: Mr A P Allen c.c. Mr R Smith

FROM: Mr A Hayden

SUBJECT: RESIGNATION OF D JONES (FOREMAN)

This is to inform you that D Jones (FOREMAN) in my section has given two months notice. It is important that we have a replacement as soon as possible if work is not going to be disrupted.

ACTION 1 What I will do:

ITEM 29

INTER OFFICE MEMO

PLASTO (NZ) LTD

TO: J F Cunningham c.c. to all department heads

FROM: Mr S L Simpkins

Our new intensive advertising campaign will start on July 10th. A mid-winter date has been chosen to try and boost sales which are normally low in mid-winter. The campaign will consist of 5 thirty second spots for a month on TV1 and TV2 as well as a series of half page advertisements in newspapers right round the country.

ACTION 1 What I will do.

ITEM 30

While you Were Out

Ms A Fleming telephoned to ask for a copy of the new white paper produced by the government on industrial relations.

ACTION 1 What I will do:

APPENDIX 5

Item No. / Estimated No. of Words	1 Uses Abbreviations	2 No. of Subordinates Involved	3 No. of Peers Involved	4 No. of Superiors Involved	5 No. of Outsiders Involved	6 Conceptual Analysis	7 Program or Phys. Values	8 Human Values--Employee Relat.	9 Aware of Superiors	10 Eval. & Develop. of Staff	11 Aware of Poor Work	12 Informality to Subordinates	13 Informality to Peers	14 Informality to Superiors	15 Courtesy to Subordinates	16 Courtesy to Peers	17 Courtesy to Superiors	18 Courtesy to Outsiders	19 Discusses with Subordinates	20 Discusses with Peers	21 Discusses with Superiors	22 Discusses with Outsiders	23 Requires Further Information	24 Asks for Info from Subordinates	25 Asks for Information from Peers	26
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Even IN-BASKET_____ SUBJECT NO._____ SCORER________________ DATE__________

Item No.	1 Estimated No. of Words	2 Uses Abbreviations	3 No. of Subordinates Involved	4 No. of Peers Involved	5 No. of Superiors Involved	6 No. of Outsiders Involved	7 Conceptual Analysis	8 Program or Phys. Values	9 Human Values--Employee Relat.	10 Aware of Superiors	11 Eval. & Develop. of Staff	12 Aware of Poor Work	13 Informality to Subordinates	14 Informality to Peers	15 Informality to Superiors	16 Courtesy to Subordinates	17 Courtesy to Peers	18 Courtesy to Superiors	19 Courtesy to Outsiders	20 Discusses with Subordinates	21 Discusses with Peers	22 Discusses with Superiors	23 Discusses with Outsiders	24 Requires Further Information	25 Asks for Info from Subordinates	26 Asks for Information from Peers
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Even IN-BASKET_____ SUBJECT NO._____ SCORER_______________ DATE__________

Asks Info--Sups.
Gives Info to Superiors
Givis Suggestions to Superiors
Gives Directions to Superiors
Explains Actions to Subords.
Explains Actions to Subords.
Explains Actions to Peers
Explains Actions to Superiors
Communicates by Writing
Communicates Face-to-Face
Delays or Postpones Decision
Procedural Decision
Concluding Decision
Makes Plans Only
Takes Leading Action
Takes Terminal Action
Schedules Work--Specific Day
Schedules Work--Specific Week
Indicates Time Priorities
Refers to Peers
Refers to Superiors
Follows Lead by Subordinates
Follows Lead by Peers
Follows Lead by Superiors
Uses Pre-Established Structure
Initiates New Structure
Encourages Quickness
Sets a Deadline
Sets up Checks on Others
Sets up Checks on Himself
Concern with Proper Channels
Responds with Specificity
Item Not Attempted

Item No.	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58
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Odd IN-BASKET____ SUBJECT NO.____ SCORER____________ DATE________

Item No.	27 Asks Info--Sups.	28 Gives Info. to Superiors	29 Gives Suggestions to Superiors	30 Gives Directions to Subords.	31 Explains Actions to Subords.	32 Explains Actions to Peers	33 Explains Actions to Superiors	34 Communicates by Writing	35 Communicates Face-to-Face	36 Delays or Postpones Decision	37 Procedural Decision	38 Concluding Decision	39 Makes Plans Only	40 Takes Leading Action	41 Takes Terminal Action	42 Schedules Work--Specific Day	43 Schedules Work--Specific Week	44 Indicates Time Priorities	45 Refers to Peers	46 Refers to Superiors	47 Follows Lead by Subordinates	48 Follows Lead by Peers	49 Follows Lead by Superiors	50 Uses Pre-Established Structure	51 Initiates New Structure	52 Encourages Quickness	53 Sets a Deadline	54 Sets up Checks on Others	55 Sets up Checks on Himself	56 Concern with Proper Channels	57 Responds with Specificity	58 Item Not Attempted
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Even IN-BASKET____ SUBJECT NO.____ SCORER________________ DATE________

IN-BASKET SCORING PROCEDURE

Introduction: Before attempting to score an in-basket, a scorer should become thoroughly familiar with the in-basket items, the background information, the Reasons for Action (RFA) Form, and the Scoring Manual.

Description of Scoring Procedure: The scoring procedure for an in-basket includes the following steps:

1. Scoring the "Courses of Action" according to responses of the subject (S) to each of the items in the in-basket. These describe what the subject did. (The lists of Courses of Action begin on p. 60.)

2. Scoring the stylistic categories, describing the manner in which the S took action, or how he took action. This part is by far the most important and therefore the most extensive.

3. Rating the subject on several aspects of his performance.

General Directions for Scoring the Courses of Action and Categories of Style: The Scoring Manual is divided into two parts: (a) the listings of the Courses of Action item by item, and (b) the definitions and rules for the stylistic categories. Each part of the Manual is prefaced by specific directions applying to that part. Below are some general directions that apply to both parts.

1. In considering each item, the scorer will examine two things: (a) what the S has written in response to the item itself, and (b) what he has written on the RFA form. The focus of scoring is what has been written in response to the item itself. The RFA form is to be used only as a scoring aid to provide interpretative information about the S's response to the item. If the S's RFA form response should contain something that is clearly an extension of his response rather than an explanation of what he has done,

do not consider the extension as the explanation. Similarly, if the response on the RFA form contains something that contradicts the S's response to the item, do not consider that part of the RFA response.

2. Score what the S actually says or does or plans, not what he should have said or done or might have said or done. That is, score only when presented with some specific evidence. In general, the scorer should allow himself only one step of inference: e.g., if the S says, "I'll call . . . ," the scorer can infer that the S will speak to that person, but not what he will say when he speaks.

3. Unless the S specifies otherwise, assume that the S himself means to do things. If, for example, the S should write "Call" and not specify further, assume that the S himself intends to call. The two exceptions are filing and typing, which are assumed to be done by his secretary unless otherwise specified.

4. Score with each item everything referring to that item, regardless of where found. Thus, if the S writes out agenda for himself, each point that relates to a particular item is to be scored along with that item. However, number of words on the RFA is not counted.

5. Unless the S states otherwise, assume that all notes, memos, etc. that he prepares will not leave his desk until after the conclusion of the test period.

6. Most items can pose more than a single problem for the S, and he may choose to take more than a single action in his response to an item. It is not always possible to identify definitely the various problems that the S sees in an item, but these can be inferred from the different courses of action he takes or plans to take in response to that item, or from the RFA form.

7. Some Courses of Action may be scored from the RFA, whether they are mentioned on the item itself or not. These concern for the most part implications of the action, or reasons for the action, such as "considers cost," "good community relations," or "will improve employee relations." Such scoring may be done only if appropriate Courses of Action are listed for the item. (Note paragraph 8 immediately following for circumstances under which stylistic categories may be scored from the RFA.)

8. If the S works on an item, but makes no corresponding response on the RFA form, score for the item response nevertheless. If, on the other hand, the S does not work on an item but writes on the RFA form something about his intentions, enter a zero in the "Number of Words" category and attempt to score only for the categories concerned with analysis (e.g., categories 7, 8, 9, 10, 11, 56) by using the information provided on the RFA form.

9. In those cases where the S fabricates, or "makes up" things, essentially two problems grow out of the original one. The first relates to the S's response to the original item, the second to the situation the S has created by his fabrication. Score the entire nonfabricated part and only the number of words for the fabricated part.

10. Whenever the scorer feels that the S's plans or actions are so unclear as to be unscorable, score that response only as much as possible, or whenever the scorer feels that he is reasonably certain of the S's intentions. If, for example, the response contains a "please," score under "Courtesy to Subordinates." Score for that part, in short, of which the scorer is sure.

11. Do not score the S's interaction with his secretary if this interaction involves only simple instructions to type and/or file and/or to

transmit letters or memos. Do score if the S goes beyond mere instructions to type and/or to transmit; e.g., score if the S specifies the number of copies to be typed, etc.

12. Whenever the S says that he will dictate a letter, the response is to be handled in exactly the same way as would a response in which the S says that he will write a letter.

13. Sometimes the S's response will involve a contingency. In such cases score all categories as though the contingency will be met.

14. Make notes of all questions you have and of all irregularities you find and bring these up with the scoring supervisor.

SUGGESTED STEPS FOR SCORING

1. PRELIMINARY PROCEDURE

A. There are separate score sheets for odd- and for even-numbered items. Use the appropriate score sheets for the half you are scoring, and fill in the spaces at the bottom of each page that identify in-basket, the scorer, etc.

B. Examine the contents of the in-basket. Look through all items to discover their relationships to each other. Look for the Reasons for Action Form, agenda, calendar, notes, etc., which might apply to more than one item and put them in front of you for ready reference.

C. Do not rearrange items according to number, but work through them as assembled by the S.

2. ITEM SCORING PROCEDURE

A. Read the item quickly if you cannot remember its contents.

B. Read the S's response written on the item itself or on a sheet of paper attached to the item.

C. Read anything else you have found on inspection that applies to the item being scored.

D. Read the Reasons for Action Form for the item in question.

E. Turn to the "Courses of Action" for the first "odd" or "even" item numbered in the pile, depending on which half you are scoring, and record the course(s) of action the S has taken by entering a "1" in the appropriate cell(s) on the score sheet.

F. After scoring "Courses of Action," turn to page 2 of the score sheet and begin scoring by counting or estimating the number of words according to detailed instructions on Category 1, Estimated Number of Words. Look at the distribution intervals of number of words and enter the proper code number in the space provided.

G. Score the item for all appropriate categories for the response given. Enter a dash if there is no score for that category for that item.

H. Continue this procedure for all of the other items.

3. FINAL PROCEDURE

Make your ratings of the S's performance on the in-basket by encircling a number on each 10-point scale. 0 is the lowest point and 9 is the highest point on each scale.

LIST OF SCORING CATEGORIES

Usual Courses of Action

Unusual Course of Action

1. Estimated Number of Words
2. Uses Abbreviations
3. Number of Subordinates Involved
4. Number of Peers Involved
5. Number of Superiors Involved
6. Number of Outsiders Involved
7. Conceptual Analysis
8. Uses Program Values or Physical Values in Analysis
9. Aware of Human Values, Feelings of Others, or Employee Relations
10. Shows Awareness of Superiors
11. Evaluation and Development of Staff
12. Shows Awareness of Poor Work
13. Informality to Subordinates
14. Informality to Peers
15. Informality to Superiors
16. Courtesy to Subordinates
17. Courtesy to Peers
18. Courtesy to Superiors
19. Courtesy to Outsiders
20. Discusses with Subordinates
21. Discusses with Peers
22. Discusses with Superiors
23. Discusses with Outsiders
24. Requires Further Information
25. Asks for Information, Opinion, Advice, or Permission from Subordinates
26. Asks for Information, Opinion, Advice, or Permission from Peers
27. Asks for Information, Opinion, Advice, or Permission from Superiors
28. Gives Information to Superiors
29. Gives Suggestions to Superiors
30. Gives Directions and/or Suggestions to Subordinates
31. Explains Actions to Subordinates
32. Explains Actions to Peers
33. Explains Actions to Superiors
34. Communicates by Writing
35. Communicates Face-to-Face
36. Delays or Postpones Decision, or Temporizes
37. Arrives at a Procedure for Deciding
38. Concluding Decision
39. Makes Tentative or Definite Plans Only
40. Takes Leading Action
41. Takes Terminal Action
42. Schedules Work for a Specific Day
43. Schedules Work for Within a Specific Week
44. Indicates Time Priorities
45. Refers to Peers
46. Refers to Superiors
47. Follows Lead by Subordinates
48. Follows Lead by Peers
49. Follows Lead by Superiors
50. Follows a Pre-Established Structure
51. Initiates a New Structure
52. Encourages or Notes Need for Quickness or Promptness
53. Sets a Deadline
54. Sets up Checks on Others
55. Sets up Checks on Himself
56. Concern with Proper Channels
57. Responds with Specificity
58. Item not Attempted

CALIFORNIA DEPARTMENT OF COMMERCE PERSONNEL

Superiors

Governor of California

George Apex

John Veep

Peers

Al Einstein

Tom Hiroshima

Joe Madison

E. Warren Mason

Grace Pryor

Harry Rush

Ora Sellers

Mary Staffer

Subordinates

Marjorie Sperry (Secretary)

Herb Bay

Alden Bee

Chet Brinkley

Jay Capitola

Ralph Chavez

Norman Dodger

Dick Fairmont

Keith Giant

Paul Hollywood

Mark Hopkins

Ray Loupe

Bill Manoogian

Hy Market

Van Ness

Jose Olivera

Dave Pasadena

Bob Rico

Al Smith

Jack Tarr

Walt Union

James Vine

HOW TO SCORE COURSES OF ACTION

USUAL COURSES OF ACTION

For each item in the in-basket, there is a list of those courses of action considered usual (see pp. 60-72). Score for any of the courses of action the S takes or plans to take by entering a "1" in the appropriate cell(s) on the score sheet.

Unless otherwise specified, the following rules apply:

Rule a: Score plans and contingent plans the same as actual actions.

Rule b: Score for a course of action regardless of whether the S actually takes the action or merely considers taking that action.

Rule c: For those courses of action in which the S refers or plans to refer a problem to another, score regardless of whether the S refers the problem directly or through his secretary.

Rule d: When the Courses of Action describe comments or evaluations, rather than actions, the RFA form may be used in scoring.

UNUSUAL COURSE OF ACTION

General Definition: Score here any course of action the S takes or plans to take that is not listed in "Usual Courses of Action."

Rule a: Unless otherwise specified, do not score here if the S takes or plans to take trivial actions, such as filing, delaying, omitting, discarding, studying later, needing more information, etc. Do score here if the S specifically indicates no action is necessary on an item on which most subjects take action.

Rule b: Do not score here embellishments or mere extensions of actions listed in "Usual Courses of Action."

<u>Rule c</u>: <u>Do not</u> score here if the unusual course of action results from an inappropriate perception of the item, an unwarranted assumption, or a fabrication.

CATEGORIES OF STYLE

Each of the Stylistic Categories describing the way in which the S took action is presented below. A general definition of what each category means, rules concerning its use, and examples are given.

Scoring for any category (except Estimated Number of Words, Number of Subordinates Involved, Number of Superiors Involved, Number of Peers Involved, Number of Outsiders Involved) is done by writing a "1" in the appropriate cell. Estimated Number of Words is scored by using the code number representing the distribution interval in which the actual or estimated total number of words falls.

Before scoring the categories, read the In-Basket Scoring Procedure on pages 6 through 11.

1. ESTIMATED NUMBER OF WORDS

General Definition: Estimate the total number of words written by the S in response to each item and enter a 0, 1, 2, 3, or 4 on the score sheet in accordance with the following principles:

0 - nothing written
1 - very short: 1-6 words written
2 - short: 7-25 words written
3 - medium: 26-75 words written
4 - long: more than 75 words written

The following rules are included as guides for estimating the number of words:

Rule a: Do not count here the number of words written on the RFA form.

Rule b: Count articles.

Rule c: Count each abbreviation as one word.

Rule d: Count each contraction and each possessive as a single word.

Rule e: Count each arabic or roman numeral sequence as a single word.

Rule f: In a hyphenated compound, count each word of the compound as a separate word only if it can stand alone.

Rule g: Handle dates in the following manner:

month - 1 word
day - 1 word
year - 1 word

Rule h: Handle time in the following manner:

6:30 - 1 word
6:30 p.m. - 2 words

Rule i: Handle telephone numbers in the following manner:

Area Code - 1 word
Exchange - 1 word
Remaining numbers - 1 word

Rule j: Count each check as one word.

Rule k: Count an asterisk, a dagger, or an arrow as one word.

Rule l: Count repetitions, if these should occur.

Rule m: Count each symbol as one word. (#, $, %, ¢, @, &, -- one word each)

Rule n: Count each set of ditto marks as one word (do not count if they are used as quotation marks).

Rule o: Do not count punctuation.

Rule p: Do not count words that the S has erased or crossed out.

Rule q: Do not count words written on paper that is obviously scrap paper to be thrown away.

Rule r: Count signatures--each word in a signature counts as one word.

Rule s: Count any single group of initials as one word.

Rule t: Count the filling in of headings on buck slips, memos, etc.

Rule u: It is not necessary for the words to be written on the item itself. Count words that belong to the item regardless of where they appear in the in-basket, except on the RFA form (e.g., on agenda, calendars, general notes, etc.).

Rule v: When two or more items are clipped together with a single response that applies equally to both, score the word count for the top item only, but score all other applicable categories for each item.

2. USES ABBREVIATIONS

General Definition: Score here if the S uses abbreviations in his written responses to other people.

Rule a: Do not score here if the only abbreviations in the item are dates or S's (in his assumed role) initials.

Rule b: Do not score here for standard abbreviations: Mr., Mrs., &, cc., and re.

Rule c: Score here for any other abbreviation, even though common to the agency (e.g., CDC--Calif. Dept. of Commerce, BDA, BDS, etc.).

Rule d: Score here if S, in returning a memo to its original sender, uses an inversion symbol, ∩∪ , or arrows reversing names on buck slip.

Rule e: Do not score here if S uses the first initial and last name for himself or others. Do score if he uses both initials for others.

APPENDIX 7

MASSEY UNIVERSITY

DEPARTMENT OF PSYCHOLOGY

IN - BASKET CONTENT CATEGORIES

ITEM 1	
Agree, as a socially responsible company	
Ask permission from MrCunningham	
Suggest a date	
Confirms/Accepts	
Passes to Mr Lowe	
Passes to Ms Myers	
Passes to Mr Wells	
Refuses	

ITEM 2	
Immediate Personal Consultation	
Delayed Personal Consultation	
Discuss to find reasons for dissatisfaction	
Suggests Restructuring	
Suggests Transfer	
Discusses with peers and subordinates on how Kelvin is coping	

ITEM 3	
Discusses with Mr Smith	
Discusses with Mr Wells	
Informs Mr Cunningham	
Obtains suggestions from all personnel staff	
Suggests a meeting	
Finds out how much productivity is lost	
Connects with wage demands	
Requests more information about procedures	
Provides some suggestions	

ITEM 4	
Refer to Management with recommendation to decline	
Refer to Management with recommendation to accept	
Refuse	
Suggest Cafetaria or Outside Only	
Discuss with Mr Smith and aks for his opinion	
Suggests donation in lieu of collection	
Respects rights of staff not to be intimidated to donate	

ITEM 5	
Phone back Cunningham	
Nothing	
Question why Cunningham was unaware of absence	
Phone Cunningham's Secretary	

ITEM 6	
Ask Mr Lowerfor impressions	
Ask Mr Myers for impressions	
Ask Mr Wells for impressions	
Ask to see report	
Ask for clarification of report	
Provides own suggestions	
Reports to Manager or Deputy Manager	

ITEM 7	
Thanks Mr Smith	
Files	
Arranges to see Davies	
Gives a copy to Myers	
Checks with Mr Smith	
Praises Ms Fleming	
Asks Lowe to provide training programme for substandard and average supervisory	

7 contd. over

ITEM 7 contd.

Talks to Substandard and Average Supervisors	
Discuss with personnel staff	

ITEM 8

Ascertain source of information	
Advise Mr Cunningham and Mr Kennedy	
Arrange a strategy	
Suggest alternatives	
Delay	
Compare with other items	
Suggest a meeting	
Ask for more information from Wells	
Raise the matter with Mr Jones	
Aware of Government Restrictions	

ITEM 9

Refer to Myers	
Refer to Lowe	
Refer to Wells	
Reply and ask for more information	
Investigate claim	
Invite A.R.E. to factory	

ITEM 9 contd.

Ignore	
Courteous Reply	

ITEM 10

Refer to Wells	
Refer to Myers	
Refer to Lowe	
Let Murphy approach production staff	
Contact Ms Fleming	
Delegate to Mr Smith	
Check that persons are suitable	

ITEM 11

Suggest a meeting	
Ring Manning	
Discuss with Manning	
Ask to see evidence	
Advise Mr Kennedy	
Advise Mr Cunningham	
Outline alternative actions	
Contact lawyers	
Check the ideas being copied	
Get information from Myers	

ITEM 12	
Place on Notice Board	
Memo to all staff	
Suggests questionnaire	
Refers to Myers	
Refers to Lowe	
Refers to Wells	
Obtain representation from each section	
Discuss with Lowe, Wells and Myers	
Inform Mr Cunningham	

ITEM 13	
Decline	
Suggests Lowe/Wells/Myers	
Agrees	
Offers services at later date/time	
Union meeting same date - can't go	

ITEM 14

Nothing	
Ring Davies	
Suggest Infofmal meeting	
Checks with Secretary	
Asks Daviesin to talk	
Checks with Davies' Superior	
Delegates to Lowe/Wells/Myers	

ITEM 15

Obtain information from General Manager	
Advise Mr Griffiths of movements	
Thanks Mr Griffiths for idea	
Asks Mr Griffiths to follow idea up	
Passes to Lowe	
Passes to Myers	
Passes to Wells	

ITEM 16	
Request more information from Mr Jones	
Agree to meeting	
Advise Mr Kennedy & Mr Cunningham	
Suggest prevention rather than compensation	

ITEM 16 contd.

Discuss with Myers/Wells/Lowe	
Delay any meeting	
Urgent meeting as soon as possible	
Discuss with production manager	

ITEM 17

Approve	
Ask to postpone	
Ask to sort out workload forst	
Make sure rest of department not unduly affected	

ITEM 18

Suggest meeting with Ms Myers	
Consider employing a recruitment officer	
See and inform Mr Kennedy	
Thank Ms Myers	
Get Myers to report	
Discuss with Myers	
Write a report	

ITEM 19

Proceed with Renewal	
If useful renew, if not, cancel	
Cancel	

ITEM 19 contd.

Suggest that the firm gets it	
Forward to Mr Kennedy	
Send to firms library	

ITEM 20

Mention to Mr Kennedy	
Use in Ammunition with union	
Delay meeting	
Delegate to Wells	
Arrange Meeting	
Reply, thank Mr Burroughs	
Suggest to Mr Burroughs possible alterations	
Refer to Mr Kennedy	
Discuss with union	
Discuss with Staff	

ITEM 21

Suggest Ms Myers arranges meeting with Mr West	
Asks Ms Myers to explain the critical incident technique	
Discusses with Ms Myers	
Suggests delaying meeting	
Sees meeting as helping to solve rating problems in company	

ITEM 22	
Reply to Mr Shearer - agree to meeting	
Agree - but obtain financial advice	
Tell Mr Cunningham	
Request more information	
Delay meeting	
Get Smith to attned to it	

ITEM 23	
Ask Manning and then reply	
Ask Myers and then reply	
Advise Fallow that he is still being considered	
Give Fallow a definite date by which results will be known	

ITEM 24	
Agree to meet Mr Reeves	
Reassure Mr Reeves	
Check with Mr Kennedy and Mr Williams.	
Get Marketing Managers views	
Write a memo to Mr Reeves	

ITEM 25	
Ask for information from peers	
Asks Myers/Wells/Lowe to investigate	
Pursues matter with Mr Simpkins	
Discusses with Mr Smith	
Suggests reducing opportunity to steal	
Suggests obtaining legal advice	
Suggests a meeting with peers and subordinates	

ITEM 26	
Personally investigate	
Arrange to have meals in cafe	
Contact Mr Hayden	
Find out specific information from Mr Jones	
Refer to Wells, Myers, Lowe	
Arrange and Discuss with Mr Jones	

ITEM 27	
Refer to Mr Simpkins	
Refer to Mr Lowe	
File	
Request more information from Mr J.S. Williams	

ITEM 28

Arrange the ad for replacement	
Contact Mr Lowe	
Discuss with Mr Jones	
Tell Mr Hayden that Jones is leaving	
Inform production manager that Jones is leaving	

ITEM 29

No action	
File it	
Inform Myers/Wells/Lowe	
Suggest Professional Agency	
Put on notice board so all can see	

ITEM 30

Obtain a copy	
send a copy	
Discuss request and reason behind it with Ms Fleming	
Phone Wells	
Ask Wells to obtain information and give it to Ms Fleming	
Wait for Fleming to phone	
Discuss with Ms Fleming	

Overall Assessment Rating Scale

How pleased do you think Plasto would be with the role player's performance (Circle a number).

Extremely pleased	9	8	7	6	5	4	3	2	1	0	Extremely displeased

APPENDIX 9

Means and standard deviations of variables used in the reliabilty analysis

VARIABLE	CASES	MEAN	STD DEV
V1	50	70.2200	12.9115
V2	50	0.6000	1.5518
V3	50	30.9400	10.5141
V4	50	5.6200	3.6972
V5	50	6.3000	3.3457
V6	50	8.5400	1.7521
V7	50	4.0200	3.7552
V8	50	2.3600	1.7468
V9	50	1.4200	1.1445
V10	50	0.0400	0.2828
V11	50	0.2800	0.6074
V12	50	0.0800	0.3405
V13	50	0.4400	1.0721
V14	50	0.0200	0.1414
V15	50	0.0400	0.1979
V16	50	7.6000	2.4159
V17	50	1.2200	1.3445
V18	50	3.5600	2.5568
V19	50	8.2800	1.2943
V20	50	8.8800	3.6958
V21	50	2.6800	2.0745
V22	50	2.0600	2.1035
V23	50	0.5000	0.6468
V24	50	0.4200	0.9708
V25	50	4.8400	2.9441
V26	50	0.7600	0.8466
V27	50	0.8400	1.3303
V28	50	1.6600	1.7096
V29	50	0.9000	1.0152
V30	50	6.5800	4.0763
V31	50	0.2400	0.6869
V32	50	0.0200	0.1414
V33	50	0.5400	2.1305
V34	50	12.9800	5.2934
V35	50	15.0200	5.2586
V36	50	0.6800	0.9988
V37	50	13.0600	4.3209
V38	50	12.3600	5.3710
V39	50	0.9800	1.3476
V40	50	13.7200	4.6381
V41	50	11.4000	5.0224
V42	50	3.4000	4.8107
V43	50	0.5400	0.9082
V44	50	0.7000	0.8391
V45	50	0.6400	0.8514
V46	50	0.3400	0.6581
V47	50	2.0000	1.5908
V48	50	0.7000	0.9313

VARIABLE	CASES	MEAN	STD DEV
V49	50	0.7600	0.9596
V50	50	0.5000	2.8446
V51	50	0.0600	0.3136
V52	50	0.2800	0.7010
V53	50	0.5000	0.8391
V54	50	1.6800	1.9529
V55	50	0.6600	1.2554
V56	50	0.0800	0.3405
V57	50	12.5200	6.6708
V58	50	0.1400	0.7001
V59	50	38.3800	5.8932
V60	50	1.6400	1.4394
OVASS1	50	5.4200	1.5791
VA1	50	68.3600	13.1952
VA2	50	1.2600	2.0285
VA3	50	30.2000	11.0195
VA4	50	5.1000	3.7756
VA5	50	5.6200	3.2255
VA6	50	7.6400	2.0280
VA7	50	1.8600	2.6109
VA8	50	1.8000	1.6036
VA9	50	1.7800	1.5817
VA10	50	0.3000	0.7071
VA11	50	0.3800	0.7253
VA12	50	0.2000	0.5345
VA13	50	0.6600	1.4230
VA14	50	0.3200	0.7126
VA15	50	0.4200	1.0120
VA16	50	6.7800	2.7202
VA17	50	1.4200	1.4581
VA18	50	3.1600	2.4105
VA19	50	7.1400	2.0204
VA20	50	7.8000	3.5514
VA21	50	2.8200	2.3878
VA22	50	1.8600	1.9061
VA23	50	0.7800	1.0359
VA24	50	0.7200	1.1959
VA25	50	4.2200	2.7942
VA26	50	0.9000	1.0738
VA27	50	0.2600	0.7508
VA28	50	1.6800	1.8674
VA29	50	0.6800	0.8908
VA30	50	6.9800	4.2737
VA31	50	0.0800	0.3405
VA32	50	0.0000	0.0000
VA33	50	0.1000	0.4165
VA34	50	13.7600	4.9757
VA35	50	16.3000	4.7820

VARIABLE	CASES	MEAN	STD DEV
VA36	50	0.6400	1.0053
VA37	50	14.2000	4.4217
VA38	50	13.3600	4.9395
VA39	50	1.0600	1.3157
VA40	50	14.6600	4.6931
VA41	50	12.5800	4.4313
VA42	50	4.3000	5.1636
VA43	50	0.4000	0.6999
VA44	50	0.7000	0.9742
VA45	50	0.5200	0.7624
VA46	50	0.2000	0.4949
VA47	50	2.7800	2.1121
VA48	50	1.1400	1.0692
VA49	50	1.3000	1.0738
VA50	50	0.0400	0.2828
VA51	50	0.0200	0.1414
VA52	50	0.2800	0.7570
VA53	50	0.5600	0.9071
VA54	50	1.6200	2.0293
VA55	50	0.5400	1.2811
VA56	50	0.0200	0.1414
VA57	50	13.7800	7.0081
VA58	50	0.1400	0.7001
VA59	50	37.1600	5.5157
VA60	50	1.6800	1.3316
OVASS2	50	5.1600	1.3456

APPENDIX 10

DESCRIPTIVE DATA AND CORRELATIONS BETWEEN THE VARIABLES USED IN THE WHOLE SAMPLE FACTOR ANALYSIS

VARIABLE	MEAN	STANDARD DEV	CASES
V1	66.2552	13.2093	431
V3	27.8469	11.3074	431
V4	5.8817	4.2620	431
V5	6.1206	3.4934	431
V16	6.8863	2.6047	431
V17	1.0603	1.1757	431
V18	2.9930	2.1528	431
V20	7.9745	3.4529	431
V21	2.5684	2.0526	431
V22	1.9814	1.9385	431
V24	0.6961	0.9990	431
V25	5.0325	3.1057	431
V26	0.9745	1.1721	431
V27	0.8538	1.2274	431
V30	5.9745	4.0129	431
V34	15.6937	4.4907	431
V35	15.3364	4.5454	431
V36	0.4849	0.9069	431
V37	12.8353	3.9963	431
V38	15.9165	4.2363	431
V39	0.9327	1.4233	431
V40	13.0487	3.9796	431
V41	14.9930	3.9997	431
V42	3.1299	3.9809	431
V43	0.3341	0.6886	431
V52	0.4942	0.9121	431
V53	0.4849	1.0517	431
V54	1.5174	1.6408	431
V55	0.4919	0.9973	431
V56	0.0209	0.1432	431
V57	16.1554	5.9919	431
V58	0.2645	1.8413	431
V59	37.9698	8.0166	431
V60	1.8886	5.3135	431
OVASS	5.3968	1.5319	431
SEX	1.3541	0.4789	353
AGE	30.3237	9.1499	346

CORRELATION COEFFICIENTS..

	V1	V3	V4	V5	V16	V17	V18	V20	V21	V22
V1	1.00000	0.32474	0.28147	0.32333	0.31744	0.20115	0.22225	0.27501	0.23762	0.21198
V3	0.32474	1.00000	0.30657	0.22572	0.26881	0.12332	0.22178	0.44388	0.32058	0.10225
V4	0.28147	0.30657	1.00000	0.25852	0.22670	0.42653	0.20622	0.19116	0.66696	0.12752
V5	0.32333	0.22572	0.25852	1.00000	0.10451	0.15562	0.53444	0.17955	0.27257	0.59443
V16	0.31744	0.26881	0.22670	0.10451	1.00000	0.29080	0.34324	-0.01662	0.08649	-0.07089
V17	0.20115	0.12332	0.42653	0.15562	0.29080	1.00000	0.25742	0.05881	0.14379	-0.04849
V18	0.22225	0.22178	0.20622	0.53444	0.34324	0.25742	1.00000	0.06473	0.14562	-0.08474
V20	0.27501	0.44388	0.19116	0.17955	-0.01662	0.05881	0.06473	1.00000	0.33805	0.19832
V21	0.23762	0.32058	0.66696	0.27257	0.08649	0.14379	0.14562	0.33805	1.00000	0.22475
V22	0.21198	0.10225	0.12752	0.59443	-0.07089	-0.04849	-0.08474	0.19832	0.22475	1.00000
V24	0.04854	-0.13053	-0.07783	0.11048	-0.08391	-0.07543	-0.01396	-0.11686	-0.09927	0.04391
V25	0.17814	0.35476	0.13013	0.08152	0.08095	0.02175	0.11481	0.05885	0.12478	0.01362
V26	0.13351	0.10622	0.42071	0.08197	0.11940	0.06862	0.11882	-0.07372	0.14137	0.01310
V27	0.15062	0.01598	0.04648	0.44616	-0.06631	-0.04545	0.07178	0.10063	0.10321	0.51689
V30	0.10704	0.33145	0.07107	0.04269	0.07714	-0.01347	-0.00029	0.21898	0.16636	0.06810
V34	0.17672	0.09672	0.08583	0.12303	0.32645	0.16163	0.29685	-0.09500	-0.04086	-0.05382
V35	0.32833	0.42216	0.26339	0.25564	-0.04744	0.01403	0.04302	0.59710	0.42163	0.27493
V36	-0.04239	-0.13199	-0.09403	-0.15872	-0.05635	0.01176	-0.12453	-0.05248	-0.06472	-0.10732
V37	0.32711	0.32289	0.20393	0.18666	-0.02370	0.04765	0.00851	0.51069	0.35363	0.15961
V38	-0.14583	-0.21335	-0.12085	-0.09502	0.11526	-0.00833	0.05756	-0.36487	-0.28097	-0.11970
V39	0.01539	-0.28388	-0.20643	-0.18265	-0.03908	-0.07262	-0.18915	-0.25826	-0.24241	-0.07885
V40	0.31112	0.32146	0.19367	0.13189	-0.03559	-0.00312	-0.01489	0.44554	0.30834	0.13909
V41	-0.12656	-0.12009	-0.05244	-0.00294	0.15640	0.04460	0.11748	-0.23526	-0.16155	-0.07740
V42	0.22995	0.26072	0.02983	0.01593	0.08553	-0.00615	0.03402	0.24674	0.07945	0.05817
V43	0.00748	0.13591	0.03252	0.00641	-0.00082	0.03824	-0.00313	0.10336	0.10718	0.03427
V52	0.05205	0.00082	-0.01483	0.03525	-0.08789	-0.05606	-0.03259	0.15834	0.05580	-0.00138
V53	0.21136	0.20963	0.11555	0.09291	0.09657	0.04399	0.07647	0.13149	0.17149	0.08998
V54	0.09958	0.02296	0.03937	0.08930	-0.03137	0.01995	0.05632	0.05693	0.00776	0.03739
V55	0.12567	0.08815	0.09634	0.01430	0.03411	0.08173	0.06333	0.10495	0.02555	0.05886
V56	0.05498	0.01922	0.04217	0.00890	0.06875	-0.03514	0.00802	0.01990	0.03865	-0.01536
V57	0.75717	0.18656	0.21217	0.29240	0.25817	0.17032	0.21894	0.09236	0.15617	0.16583
V58	-0.34271	-0.17320	-0.11128	-0.08090	-0.19932	-0.07077	-0.06290	-0.21585	-0.11187	-0.04684
V59	0.45647	0.47290	0.30278	0.40661	0.24296	0.18105	0.24819	0.46171	0.33528	0.27023
V60	-0.21288	-0.13057	-0.09999	-0.08886	-0.08846	-0.01493	-0.01918	-0.16811	-0.12489	-0.08758
OVASS	0.53696	0.30128	0.18494	0.29131	0.19783	0.08739	0.23776	0.19800	0.18326	0.14031
SEX	-0.14778	-0.08754	-0.06508	-0.05761	-0.03346	-0.04824	-0.02685	-0.10917	-0.05533	-0.02187
AGE	0.12136	0.19810	0.22996	0.06851	0.22588	0.19607	0.08448	0.20200	0.19504	-0.03650

	V24	V25	V26	V27	V30	V34	V35	V36	V37	V38
V1	0.04854	0.17814	0.13351	0.15062	0.10704	0.17672	0.32833	-0.04239	0.32711	-0.14583
V3	-0.13053	0.35476	0.10622	0.01598	0.33145	0.09672	0.42216	-0.13199	0.32289	-0.21335
V4	-0.07783	0.13013	0.42071	0.04648	0.07107	0.08583	0.26339	-0.09403	0.20393	-0.12085
V5	0.11048	0.08152	0.08197	0.44616	0.04269	0.12303	0.25564	-0.15872	0.18666	-0.09502
V16	-0.08391	0.08095	0.11940	-0.06631	0.07714	0.32645	-0.04744	-0.05635	-0.02370	0.11526
V17	-0.07543	0.02175	0.06862	-0.04545	-0.01347	0.16163	0.01403	0.01176	0.04765	-0.00833
V18	-0.01396	0.11481	0.11882	0.07178	-0.00029	0.29685	0.04302	-0.12453	0.00851	0.05756
V20	-0.11686	0.05885	-0.07372	0.10063	0.21898	-0.09500	0.59710	-0.05248	0.51069	-0.36487
V21	-0.09927	0.12478	0.14137	0.10321	0.16636	-0.04086	0.42163	-0.06472	0.35363	-0.28097
V22	0.04391	0.01362	0.01310	0.51689	0.06810	-0.05382	0.27493	-0.10732	0.15961	-0.11970
V24	1.00000	-0.04103	0.04897	0.17610	-0.17133	-0.01821	-0.02352	-0.05769	0.01073	0.02751
V25	-0.04103	1.00000	0.15100	0.00613	0.66696	0.25083	0.15474	-0.08075	0.09243	0.01240
V26	0.04897	0.15100	1.00000	0.02973	0.05474	0.11118	0.05793	-0.05178	-0.02076	0.08481
V27	0.17610	0.00613	0.02973	1.00000	-0.02059	0.02730	0.18599	-0.13257	0.16339	-0.06944
V30	-0.17133	0.66696	0.05474	-0.02059	1.00000	0.21675	0.24666	0.00021	0.18042	-0.08987
V34	-0.01821	0.25083	0.11118	0.02730	0.21675	1.00000	-0.34415	-0.09593	-0.26511	0.44839
V35	-0.02352	0.15474	0.05793	0.18599	0.24666	-0.34415	1.00000	-0.10173	0.70502	-0.52730
V36	-0.05769	-0.08075	-0.05178	-0.13257	0.00021	-0.09593	-0.10173	1.00000	-0.06710	-0.15711
V37	0.01073	0.09243	-0.02076	0.16339	0.18042	-0.26511	0.70502	-0.06710	1.00000	-0.80898
V38	0.02751	0.01240	0.08481	-0.06944	-0.08987	0.44839	-0.52730	-0.15711	-0.80898	1.00000
V39	0.04610	-0.21417	-0.11814	-0.10017	-0.26090	-0.26267	-0.28085	0.13885	-0.18636	0.11131
V40	0.02187	0.12933	0.03168	0.14668	0.16769	-0.24134	0.66929	-0.02718	0.88066	-0.72040
V41	0.00587	0.02941	0.04858	-0.04900	0.00173	0.49811	-0.42649	-0.13371	-0.67999	0.85806
V42	-0.16196	0.13020	-0.03567	-0.04370	0.23967	0.08419	0.25128	0.03533	0.24868	-0.22965
V43	-0.10558	0.04167	-0.00094	-0.01913	0.05611	0.03091	0.12227	0.03788	0.09526	-0.10043
V52	-0.03895	-0.00732	-0.07737	0.00859	0.05746	0.04101	0.09443	0.05542	0.11937	-0.08680
V53	-0.06303	0.25575	0.07609	0.08746	0.31536	0.12310	0.19638	0.01378	0.16180	-0.11251
V54	0.17561	0.01449	0.03953	0.14388	-0.09830	-0.05451	0.13221	-0.17214	0.17369	-0.09147
V55	-0.03166	0.08793	0.04260	0.05697	0.15887	0.15158	0.09474	0.01593	0.03730	-0.00401
V56	-0.03682	-0.04861	0.03090	-0.02230	0.00093	0.02444	-0.00725	0.13678	-0.01837	0.01055
V57	0.17729	0.13432	0.12673	0.17923	-0.05825	0.17722	0.10993	-0.09522	0.10596	0.00015
V58	0.01220	-0.12433	-0.05506	-0.03945	-0.13568	-0.25063	-0.23796	-0.02407	-0.24312	-0.22942
V59	-0.04296	0.33359	0.07640	0.17114	0.29795	0.25950	0.38869	-0.15921	0.34821	-0.10211
V60	0.05100	-0.05263	-0.03892	-0.07025	-0.09491	-0.13057	-0.15087	0.01944	-0.15573	-0.03306
OVASS	0.06986	0.31989	0.14294	0.12739	0.18247	0.25501	0.19687	-0.16559	0.15771	-0.02032
SEX	0.09520	0.05674	0.11107	-0.02252	0.04179	-0.01706	-0.09479	0.00949	-0.07292	0.04978
AGE	-0.19700	0.06856	0.01096	-0.09176	0.16982	0.02967	0.19753	-0.08650	0.26030	-0.15342

	V39	V40	V41	V42	V43	V52	V53	V54	V55	V56
V1	0.01539	0.31112	-0.12656	0.22995	0.00748	0.05205	0.21136	0.09958	0.12567	0.05498
V3	-0.28388	0.32146	-0.12009	0.26072	0.13591	0.00082	0.20963	0.02296	0.08815	0.01922
V4	-0.20643	0.19367	-0.05244	0.02983	0.03252	-0.01483	0.11555	0.03937	0.09634	0.04217
V5	-0.18265	0.13189	-0.00294	0.01593	0.00641	0.03525	0.09291	0.08930	0.01430	0.00890
V16	-0.03908	-0.03559	0.15640	0.08553	-0.00082	-0.08789	0.09657	-0.03137	0.03411	0.06875
V17	-0.07262	-0.00312	0.04460	-0.00615	0.03824	-0.05606	0.04399	0.01995	0.08173	-0.03514
V18	-0.18915	-0.01489	0.11748	0.03402	-0.00313	-0.03259	0.07647	0.05632	0.06333	0.00802
V20	-0.25826	0.44554	-0.23526	0.24674	0.10336	0.15834	0.13149	0.05693	0.10495	0.01990
V21	-0.24241	0.30834	-0.16155	0.07945	0.10718	0.05580	0.17149	0.00776	0.02555	0.03865
V22	-0.07885	0.13909	-0.07740	0.05817	0.03427	-0.00138	0.08998	0.03739	0.05886	-0.01536
V24	0.04610	0.02187	0.00587	-0.16196	-0.10558	-0.03895	-0.06303	0.17561	-0.03166	-0.03682
V25	-0.21417	0.12933	0.02941	0.13020	0.04167	-0.00732	0.25575	0.01449	0.08793	-0.04861
V26	-0.11814	0.03168	0.04858	-0.03567	-0.00094	-0.07737	0.07609	0.03953	0.04260	0.03090
V27	-0.10017	0.14668	-0.04900	-0.04370	-0.01913	0.00859	0.08746	0.14388	0.05697	-0.02230
V30	-0.26090	0.16769	0.00173	0.23967	0.05611	0.05746	0.31536	-0.09830	0.15887	0.00093
V34	-0.26267	-0.24134	0.49811	0.08419	0.03091	0.04101	0.12310	-0.05451	0.15158	0.02444
V35	-0.28085	0.66929	-0.42649	0.25128	0.12227	0.09443	0.19638	0.13221	0.09474	-0.00725
V36	0.13885	-0.02718	-0.13371	0.03533	0.03788	0.05542	0.01378	-0.17214	0.01593	0.13678
V37	-0.18636	0.88066	-0.67999	0.24868	0.09526	0.11937	0.16180	0.17369	0.03730	-0.01837
V38	0.11131	-0.72040	0.85806	-0.22965	-0.10043	-0.08680	-0.11251	-0.09147	-0.00401	0.01055
V39	1.00000	-0.25728	-0.08751	-0.20697	-0.08142	-0.00657	-0.13818	0.02191	-0.12081	-0.01592
V40	-0.25728	1.00000	-0.76092	0.26926	0.08655	0.09458	0.18937	0.14750	0.03789	-0.03445
V41	-0.08751	-0.76092	1.00000	-0.20384	-0.05826	-0.05133	-0.09594	-0.10825	0.03234	0.04493
V42	-0.20697	0.26926	-0.20384	1.00000	0.13683	-0.01645	0.32096	-0.12105	0.09633	-0.06190
V43	-0.08142	0.08655	-0.05826	0.13683	1.00000	0.06974	0.16753	0.01748	0.01412	-0.07094
V52	-0.00657	0.09458	-0.05133	-0.01645	0.06974	1.00000	0.03809	-0.06559	-0.02242	0.04546
V53	-0.13818	0.18937	-0.09594	0.32096	0.16753	0.03809	1.00000	0.09145	0.15785	0.00982
V54	0.02191	0.14750	-0.10825	-0.12105	0.01748	-0.06559	0.09145	1.00000	0.14114	-0.02630
V55	-0.12081	0.03789	0.03234	0.09633	0.01412	-0.02242	0.15785	0.14114	1.00000	-0.00695
V56	-0.01592	-0.03445	0.04493	-0.06190	-0.07094	0.04546	0.00982	-0.02630	-0.00695	1.00000
V57	0.09122	0.06776	0.00538	0.04302	-0.06335	-0.01281	0.12603	0.14366	0.01364	0.03959
V58	-0.05176	-0.22679	-0.24543	-0.08434	-0.03501	-0.05309	-0.04717	-0.05079	-0.03429	-0.02100
V59	-0.26944	0.30205	0.01211	0.22937	0.05575	0.06406	0.16089	0.06820	0.11064	0.03703
V60	0.06266	-0.15273	-0.05212	-0.05583	0.02036	-0.07499	-0.07271	-0.06860	-0.01992	-0.00305
OVASS	-0.17439	0.20281	-0.01511	0.20736	0.05041	0.02412	0.23105	0.14759	0.12160	-0.00605
SEX	0.04226	-0.01894	0.00820	-0.05624	-0.01851	0.05811	0.03047	-0.06693	-0.04205	-0.03315
AGE	-0.17297	0.20878	-0.09786	0.13266	0.06501	0.11031	0.11108	0.04828	-0.02375	-0.00756

	V57	V58	V59	V60	OVASS	SEX	AGE
V1	0.75717	-0.34271	0.45647	-0.21288	0.53696	-0.14778	0.12136
V3	0.18656	-0.17320	0.47290	-0.13057	0.30128	-0.08754	0.19810
V4	0.21217	-0.11128	0.30278	-0.09999	0.18494	-0.06508	0.22996
V5	0.29240	-0.08090	0.40661	-0.08886	0.29131	-0.05761	0.06851
V16	0.25817	-0.19932	0.24296	-0.08846	0.19783	-0.03346	0.22588
V17	0.17032	-0.07077	0.18105	-0.01493	0.08739	-0.04824	0.19607
V18	0.21894	-0.06290	0.24819	-0.01918	0.23776	-0.02685	0.08448
V20	0.09236	-0.21585	0.46171	-0.16811	0.19800	-0.10917	0.20200
V21	0.15617	-0.11187	0.33528	-0.12489	0.18326	-0.05533	0.19504
V22	0.16583	-0.04684	0.27023	-0.08758	0.14031	-0.02187	-0.03650
V24	0.17729	0.01220	-0.04296	0.05100	0.06986	0.09520	-0.19700
V25	0.13432	-0.12433	0.33359	-0.05263	0.31989	0.05674	0.06856
V26	0.12673	-0.05506	0.07640	-0.03892	0.14294	0.11107	0.01096
V27	0.17923	-0.03945	0.17114	-0.07025	0.12739	-0.02252	-0.09176
V30	-0.05825	-0.13568	0.29795	-0.09491	0.18247	0.04179	0.16982
V34	0.17722	-0.25063	0.25950	-0.13057	0.25501	-0.01706	0.02967
V35	0.10993	-0.23796	0.38869	-0.15087	0.19687	-0.09479	0.19753
V36	-0.09522	-0.02407	-0.15921	0.01944	-0.16559	0.00949	-0.08650
V37	0.10596	-0.24312	0.34821	-0.15573	0.15771	-0.07292	0.26030
V38	0.00015	-0.22942	-0.10211	-0.03306	-0.02032	0.04978	-0.15342
V39	0.09122	-0.05176	-0.26944	0.06266	-0.17439	0.04226	-0.17297
V40	0.06776	-0.22679	0.30205	-0.15273	0.20281	-0.01894	0.20878
V41	0.00538	-0.24543	0.01211	-0.05212	-0.01511	0.00820	-0.09786
V42	0.04302	-0.08434	0.22937	-0.05583	0.20736	-0.05624	0.13266
V43	-0.06335	-0.03501	0.05575	0.02036	0.05041	-0.01851	0.06501
V52	-0.01281	-0.05309	0.06406	-0.07499	0.02412	0.05811	0.11031
V53	0.12603	-0.04717	0.16089	-0.07271	0.23105	0.03047	0.11108
V54	0.14366	-0.05079	0.06820	-0.06860	0.14759	-0.06693	0.04828
V55	0.01364	-0.03429	0.11064	-0.01992	0.12160	-0.04205	-0.02375
V56	0.03959	-0.02100	0.03703	-0.00305	-0.00605	-0.03315	-0.00756
V57	1.00000	-0.17216	0.33556	-0.09288	0.55646	-0.04626	-0.02826
V58	-0.17216	1.00000	-0.36042	0.34673	-0.15931	0.02990	-0.09977
V59	0.33556	-0.36042	1.00000	0.06423	0.39466	-0.08297	0.18286
V60	-0.09288	0.34673	0.06423	1.00000	-0.14798	0.09720	-0.01697
OVASS	0.55646	-0.15931	0.39466	-0.14798	1.00000	-0.00562	-0.01926
SEX	-0.04626	0.02990	-0.08297	0.09720	-0.00562	1.00000	-0.24653
AGE	-0.02826	-0.09977	0.18286	-0.01697	-0.01926	-0.24653	1.00000

APPENDIX 10
(Continued)
Correlation Coefficients from factor
analysis of split group A

CORRELATION COEFFICIENTS..

	V1	V3	V4	V5	V16	V17	V18	V20	V21	V22
V1	1.00000	0.28655	0.31475	0.26940	0.29328	0.24420	0.24871	0.28583	0.25697	0.18256
V3	0.28655	1.00000	0.23258	0.14273	0.26240	0.12981	0.29061	0.37236	0.26175	-0.03663
V4	0.31475	0.23258	1.00000	0.26240	0.18201	0.51804	0.22938	0.16050	0.65083	0.05334
V5	0.26940	0.14273	0.26240	1.00000	0.06114	0.24587	0.48549	0.16207	0.25029	0.61124
V16	0.29328	0.26240	0.18201	0.06114	1.00000	0.33465	0.39450	-0.03367	-0.00038	-0.11498
V17	0.24420	0.12981	0.51804	0.24587	0.33465	1.00000	0.32132	0.08184	0.22647	-0.00996
V18	0.24871	0.29061	0.22938	0.48549	0.39450	0.32132	1.00000	0.13293	0.14243	-0.13161
V20	0.28583	0.37236	0.16050	0.16207	-0.03367	0.08184	0.13293	1.00000	0.28169	0.12371
V21	0.25697	0.26175	0.65083	0.25029	-0.00038	0.22647	0.14243	0.28169	1.00000	0.18021
V22	0.18256	-0.03663	0.05334	0.61124	-0.11498	-0.00996	-0.13161	0.12371	0.18021	1.00000
V24	0.05204	-0.16558	-0.14674	0.08493	-0.09094	-0.10002	-0.05804	-0.15495	-0.18168	0.03940
V25	0.06379	0.30167	0.07479	-0.09288	0.06549	0.00953	0.09470	-0.09978	0.09735	-0.18460
V26	0.07044	0.03460	0.31984	0.07762	0.05216	-0.00322	0.16731	-0.13774	0.05847	-0.01832
V27	0.19085	-0.00441	-0.00850	0.47919	-0.06877	-0.01663	0.08873	0.13176	0.01808	0.53443
V30	0.00981	0.28526	0.01712	-0.10155	0.06899	0.02929	-0.02191	0.09876	0.15513	-0.11759
V34	0.12687	0.07870	0.07178	-0.00946	0.31221	0.18778	0.26826	-0.19625	-0.07557	-0.18566
V35	0.30254	0.37048	0.23512	0.26636	-0.07464	0.04805	0.08404	0.58510	0.37510	0.26322
V36	-0.08170	-0.11789	-0.06582	-0.16962	-0.11555	0.08654	-0.15566	0.03702	-0.02676	-0.10867
V37	0.28546	0.31116	0.21597	0.20512	-0.11726	0.07527	0.04402	0.52944	0.32716	0.15244
V38	-0.26448	-0.27267	-0.18164	-0.17143	0.13466	-0.08755	-0.01600	-0.50586	-0.31276	-0.15674
V39	0.00164	-0.25346	-0.07756	-0.11190	-0.02887	-0.03233	-0.09857	-0.21475	-0.10275	-0.04311
V40	0.23412	0.32016	0.18273	0.09423	-0.12763	-0.01599	-0.02295	0.44127	0.25347	0.15156
V41	-0.21898	-0.22719	-0.13662	-0.05514	0.15876	0.00301	0.06001	-0.39148	-0.21417	-0.15345
V42	0.25908	0.29151	-0.02430	-0.05576	0.13135	0.05979	0.05593	0.30930	0.06710	0.04156
V43	0.04237	0.20349	0.02148	0.04854	0.04379	0.08081	-0.03906	0.17597	0.08867	0.04033
V52	-0.01148	0.04375	0.06301	0.00774	-0.14389	-0.12220	-0.02686	0.16955	0.12202	-0.01019
V53	0.22454	0.17323	0.07790	0.06794	0.14928	0.12575	0.18697	0.14705	0.12838	0.01395
V54	0.12539	0.09515	0.01414	0.15331	-0.02568	0.02459	0.12227	0.07982	-0.01810	0.02539
V55	0.16555	0.09006	0.13087	-0.05709	0.13819	0.16558	0.05138	0.06616	0.02400	-0.06195
V56	0.09462	0.08083	0.03954	0.03156	0.04202	-0.02729	-0.02592	-0.02863	0.00944	0.02342
V57	0.77779	0.16615	0.24661	0.26387	0.23475	0.22706	0.23999	0.07365	0.16137	0.15400
V58	-0.10306	-0.15253	-0.05375	0.04797	-0.06801	0.01232	-0.04100	-0.15154	-0.13544	0.09527
V59	0.52952	0.49165	0.30913	0.41408	0.21605	0.26397	0.31123	0.46772	0.35879	0.22079
V60	-0.23529	-0.30666	-0.08054	-0.03889	-0.20300	-0.14849	-0.11609	-0.25236	-0.06341	0.03865
OVASS	0.57019	0.30121	0.22704	0.22123	0.16731	0.15816	0.25926	0.17594	0.18557	0.05894
AGE	0.06525	0.23178	0.24035	0.00697	0.24170	0.18976	0.01205	0.21822	0.18544	-0.05121
SEX	-0.14069	-0.13801	-0.09661	-0.03571	-0.11121	-0.08591	-0.00216	-0.14984	-0.12415	-0.01639

	V24	V25	V26	V27	V30	V34	V35	V36	V37	V38
V1	0.05204	0.06379	0.07044	0.19085	0.00981	0.12687	0.30254	-0.08170	0.28546	-0.26448
V3	-0.16558	0.30167	0.03460	-0.00441	0.28526	0.07870	0.37048	-0.11789	0.31116	-0.27267
V4	-0.14674	0.07479	0.31984	-0.00850	0.01712	0.07178	0.23512	-0.06582	0.21597	-0.18164
V5	0.08493	-0.09288	0.07762	0.47919	-0.10155	-0.00946	0.26636	-0.16962	0.20512	-0.17143
V16	-0.09094	0.06549	0.05216	-0.06877	0.06899	0.31221	-0.07464	-0.11555	-0.11726	0.13466
V17	-0.10002	0.00953	-0.00322	-0.01663	0.02929	0.18778	0.04805	0.08654	0.07527	-0.08755
V18	-0.05804	0.09470	0.16731	0.08873	-0.02191	0.26826	0.08404	-0.15566	0.04402	-0.01600
V20	-0.15495	-0.09978	-0.13774	0.13176	0.09876	-0.19625	0.58510	0.03702	0.52944	-0.50586
V21	-0.18168	0.09735	0.05847	0.01808	0.15513	-0.07557	0.37510	-0.02676	0.32716	-0.31276
V22	0.03940	-0.18460	-0.01832	0.53443	-0.11759	-0.18566	0.26322	-0.10867	0.15244	-0.15674
V24	1.00000	-0.10572	0.02207	0.08366	-0.24687	-0.00325	-0.14420	-0.02769	-0.02655	0.04349
V25	-0.10572	1.00000	0.13417	-0.08067	0.64874	0.15813	0.12630	-0.14212	0.08662	-0.00125
V26	0.02207	0.13417	1.00000	-0.02648	-0.00414	0.16161	-0.05082	-0.12765	-0.08391	0.13933
V27	0.08366	-0.08067	-0.02648	1.00000	-0.08329	-0.04185	0.23762	-0.13323	0.20545	-0.12958
V30	-0.24687	0.64874	-0.00414	-0.08329	1.00000	0.08869	0.17160	0.01060	0.10509	-0.07180
V34	-0.00325	0.15813	0.16161	-0.04185	0.08869	1.00000	-0.42681	-0.10542	-0.35349	0.45123
V35	-0.14420	0.12630	-0.05082	0.23762	0.17160	-0.42681	1.00000	-0.14035	0.68429	-0.62981
V36	-0.02769	-0.14212	-0.12765	-0.13323	0.01060	-0.10542	-0.14035	1.00000	-0.05260	-0.20087
V37	-0.02655	0.08662	-0.08391	0.20545	0.10509	-0.35349	0.68429	-0.05260	1.00000	-0.90942
V38	0.04349	-0.00125	0.13933	-0.12958	-0.07180	0.45123	-0.62981	-0.20087	-0.90942	1.00000
V39	0.08668	-0.20730	-0.08231	-0.07918	-0.27199	-0.20834	-0.25160	0.09530	-0.16549	0.08025
V40	-0.02596	0.11821	-0.05614	0.17340	0.07030	-0.30637	0.60981	0.00879	0.85379	-0.81809
V41	0.02368	-0.02369	0.10711	-0.10982	-0.00182	0.44652	-0.52508	-0.21053	-0.80817	0.87936
V42	-0.22335	0.17608	-0.04892	-0.06706	0.26955	0.01098	0.27345	0.02461	0.24560	-0.27020
V43	-0.06576	-0.05260	-0.03876	-0.01880	0.01088	0.06927	0.14698	0.02170	0.15548	-0.12743
V52	-0.07397	-0.05281	-0.01048	0.00846	-0.02346	0.05616	0.08759	0.05354	0.07344	-0.04820
V53	-0.10551	0.27564	0.09030	0.07084	0.22263	0.13297	0.16478	0.05379	0.08322	-0.07637
V54	0.15824	0.06622	0.07597	0.18336	-0.16457	-0.11355	0.21925	-0.15867	0.23822	-0.17355
V55	-0.03386	0.17418	0.07967	0.06955	0.16565	0.15399	0.06090	0.05349	-0.02360	0.01395
V56	-0.05819	-0.09716	0.05626	-0.02635	-0.05080	0.07729	-0.06005	0.18198	-0.08437	0.05427
V57	0.19366	0.01414	0.10804	0.19774	-0.15013	0.14344	0.09684	-0.14487	0.12560	-0.07204
V58	0.13230	-0.10524	0.02316	0.02389	-0.15719	-0.12531	-0.12534	0.01060	-0.09688	-0.04275
V59	-0.10257	0.20510	0.01988	0.20450	0.18355	0.16319	0.44232	-0.14448	0.36029	-0.26760
V60	0.18473	-0.24152	0.01613	-0.05723	-0.26334	-0.24856	-0.23070	0.16265	-0.09749	-0.01918
OVASS	0.04779	0.27085	0.20189	0.09545	0.07362	0.22019	0.19380	-0.24970	0.16050	-0.03993
AGE	-0.28618	0.02285	0.02106	-0.15550	0.19082	-0.02158	0.23157	-0.04324	0.29085	-0.24768
SEX	0.09652	0.07370	0.14876	-0.03515	0.04794	-0.01044	-0.15714	0.02325	-0.09878	0.10511

	V39	V40	V41	V42	V43	V52	V53	V54	V55	V56
V1	0.00164	0.23412	-0.21898	0.25908	0.04237	-0.01148	0.22454	0.12539	0.16555	0.09462
V3	-0.25346	0.32016	-0.22719	0.29151	0.20349	0.04375	0.17323	0.09515	0.09006	0.08083
V4	-0.07756	0.18273	-0.13662	-0.02430	0.02148	0.06301	0.07790	0.01414	0.13087	0.03954
V5	-0.11190	0.09423	-0.05514	-0.05576	0.04854	0.00774	0.06794	0.15331	-0.05709	0.03156
V16	-0.02887	-0.12763	0.15876	0.13135	0.04379	-0.14389	0.14928	-0.02568	0.13819	0.04202
V17	-0.03233	-0.01599	0.00301	0.05979	0.08081	-0.12220	0.12575	0.02459	0.16558	-0.02729
V18	-0.09857	-0.02295	0.06001	0.05593	-0.03906	-0.02686	0.18697	0.12227	0.05138	-0.02592
V20	-0.21475	0.44127	-0.39148	0.30930	0.17597	0.16955	0.14705	0.07982	0.06616	-0.02863
V21	-0.10275	0.25347	-0.21417	0.06710	0.08867	0.12202	0.12838	-0.01810	0.02400	0.00944
V22	-0.04311	0.15156	-0.15345	0.04156	0.04033	-0.01019	0.01395	0.02539	-0.06195	0.02342
V24	0.08668	-0.02596	0.02368	-0.22335	-0.06576	-0.07397	-0.10551	0.15824	-0.03386	-0.05819
V25	-0.20730	0.11821	-0.02369	0.17608	-0.05260	-0.05281	0.27564	0.06622	0.17418	-0.09716
V26	-0.08231	-0.05614	0.10711	-0.04892	-0.03876	-0.01048	0.09030	0.07597	0.07967	0.05626
V27	-0.07918	0.17340	-0.10982	-0.06706	-0.01880	0.00846	0.07084	0.18336	0.06955	-0.02635
V30	-0.27199	0.07030	-0.00182	0.26955	0.01088	-0.02346	0.22263	-0.16457	0.16565	-0.05080
V34	-0.20834	-0.30637	0.44652	0.01098	0.06927	0.05616	0.13297	-0.11355	0.15399	0.07729
V35	-0.25160	0.60981	-0.52508	0.27345	0.14698	0.08759	0.16478	0.21925	0.06090	-0.06005
V36	0.09530	0.00879	-0.21053	0.02461	0.02170	0.05354	0.05379	-0.15867	0.05349	0.18198
V37	-0.16549	0.85379	-0.80817	0.24560	0.15548	0.07344	0.08322	0.23822	-0.02360	-0.08437
V38	0.08025	-0.81809	0.87936	-0.27020	-0.12743	-0.04820	-0.07637	-0.17355	0.01395	0.05427
V39	1.00000	-0.25835	-0.04096	-0.16003	-0.09503	-0.01403	-0.17105	-0.03849	-0.09336	0.02934
V40	-0.25835	1.00000	-0.90816	0.24552	0.12480	0.03402	0.13922	0.19635	0.00474	-0.10116
V41	-0.04096	-0.90816	1.00000	-0.25346	-0.07670	-0.01771	-0.09230	-0.17184	0.03996	0.08179
V42	-0.16003	0.24552	-0.25346	1.00000	0.11396	-0.06794	0.34206	-0.07139	0.07540	-0.05465
V43	-0.09503	0.12480	-0.07670	0.11396	1.00000	0.10568	0.12224	0.04947	-0.03352	-0.08884
V52	-0.01403	0.03402	-0.01771	-0.06794	0.10568	1.00000	0.00041	-0.09453	-0.02472	0.16550
V53	-0.17105	0.13922	-0.09230	0.34206	0.12224	0.00041	1.00000	0.09980	0.14168	0.00553
V54	-0.03849	0.19635	-0.17184	-0.07139	0.04947	-0.09453	0.09980	1.00000	0.16245	-0.09173
V55	-0.09336	0.00474	0.03996	0.07540	-0.03352	-0.02472	0.14168	0.16245	1.00000	0.01729
V56	0.02934	-0.10116	0.08179	-0.05465	-0.08884	0.16550	0.00553	-0.09173	0.01729	1.00000
V57	0.14900	0.05031	-0.03859	0.04027	-0.02414	-0.00567	0.12820	0.14223	0.05262	0.06313
V58	0.01068	-0.09491	-0.03076	-0.07859	-0.08527	0.01802	-0.07993	-0.03712	-0.03916	-0.03770
V59	-0.24234	0.29104	-0.17330	0.18294	0.12391	0.11434	0.13235	0.15518	0.08504	-0.00445
V60	0.21294	-0.10216	-0.03376	-0.14483	-0.06653	-0.07818	-0.06735	-0.00782	-0.04616	0.08573
OVASS	-0.12260	0.17981	-0.05912	0.20296	0.06571	-0.01517	0.21888	0.20674	0.17277	-0.03218
AGE	-0.12899	0.26603	-0.23864	0.21517	0.15656	0.02311	0.08863	0.06587	-0.02572	0.00128
SEX	0.07254	-0.05449	0.05827	-0.11281	-0.12462	0.19466	0.05246	-0.07302	0.00793	0.01851

	V57	V58	V59	V60	OVASS	AGE	SEX
V1	0.77779	-0.10306	0.52952	-0.23529	0.57019	0.06525	-0.14069
V3	0.16615	-0.15253	0.49165	-0.30666	0.30121	0.23178	-0.13801
V4	0.24661	-0.05375	0.30913	-0.08054	0.22704	0.24035	-0.09661
V5	0.26387	0.04797	0.41408	-0.03889	0.22123	0.00697	-0.03571
V16	0.23475	-0.06801	0.21605	-0.20300	0.16731	0.24170	-0.11121
V17	0.22706	0.01232	0.26397	-0.14849	0.15816	0.18976	-0.08591
V18	0.23999	-0.04100	0.31123	-0.11609	0.25926	0.01205	-0.00216
V20	0.07365	-0.15154	0.46772	-0.25236	0.17594	0.21822	-0.14984
V21	0.16137	-0.13544	0.35879	-0.06341	0.18557	0.18544	-0.12415
V22	0.15400	0.09527	0.22079	0.03865	0.05894	-0.05121	-0.01639
V24	0.19366	0.13230	-0.10257	0.18473	0.04779	-0.28618	0.09652
V25	0.01414	-0.10524	0.20510	-0.24152	0.27085	0.02285	0.07370
V26	0.10804	0.02316	0.01988	0.01613	0.20189	0.02106	0.14876
V27	0.19774	0.02389	0.20450	-0.05723	0.09545	-0.15550	-0.03515
V30	-0.15013	-0.15719	0.18355	-0.26334	0.07362	0.19082	0.04794
V34	0.14344	-0.12531	0.16319	-0.24856	0.22019	-0.02158	-0.01044
V35	0.09684	-0.12534	0.44232	-0.23070	0.19380	0.23157	-0.15714
V36	-0.14487	0.01060	-0.14448	0.16265	-0.24970	-0.04324	0.02325
V37	0.12560	-0.09688	0.36029	-0.09749	0.16050	0.29085	-0.09878
V38	-0.07204	-0.04275	-0.26760	-0.01918	-0.03993	-0.24768	0.10511
V39	0.14900	0.01068	-0.24234	0.21294	-0.12260	-0.12899	0.07254
V40	0.05031	-0.09491	0.29104	-0.10216	0.17981	0.26603	-0.05449
V41	-0.03859	-0.03076	-0.17330	-0.03376	-0.05912	-0.23864	0.05827
V42	0.04027	-0.07859	0.18294	-0.14483	0.20296	0.21517	-0.11281
V43	-0.02414	-0.08527	0.12391	-0.06653	0.06571	0.15656	-0.12462
V52	-0.00567	0.01802	0.11434	-0.07818	-0.01517	0.02311	0.19466
V53	0.12820	-0.07993	0.13235	-0.06735	0.21888	0.08863	0.05246
V54	0.14223	-0.03712	0.15518	-0.00782	0.20674	0.06587	-0.07302
V55	0.05262	-0.03916	0.08504	-0.04616	0.17277	-0.02572	0.00793
V56	0.06313	-0.03770	-0.00445	0.08573	-0.03218	0.00128	0.01851
V57	1.00000	-0.07601	0.39849	-0.12630	0.57026	-0.09189	-0.03549
V58	-0.07601	1.00000	-0.20604	0.35714	-0.22198	-0.11354	-0.06089
V59	0.39849	-0.20604	1.00000	-0.56396	0.44631	0.13106	-0.14944
V60	-0.12630	0.35714	-0.56396	1.00000	-0.30998	-0.11892	0.05288
OVASS	0.57026	-0.22198	0.44631	-0.30998	1.00000	-0.05648	0.00818
AGE	-0.09189	-0.11354	0.13106	-0.11892	-0.05648	1.00000	-0.21961
SEX	-0.03549	-0.06089	-0.14944	0.05288	0.00818	-0.21961	1.00000

APPENDIX 10
(Continued)
Correlation coefficients from factor analysis of split group B

CORRELATION COEFFICIENTS..

	V1	V3	V4	V5	V16	V17	V18	V20	V21	V22
V1	1.00000	0.35648	0.24711	0.38165	0.34159	0.15419	0.19712	0.26915	0.21802	0.25271
V3	0.35648	1.00000	0.37444	0.30349	0.27480	0.11532	0.16287	0.51304	0.37427	0.25089
V4	0.24711	0.37444	1.00000	0.25506	0.27137	0.33247	0.18364	0.22286	0.68326	0.21544
V5	0.38165	0.30349	0.25506	1.00000	0.14817	0.06484	0.58249	0.19623	0.29534	0.57753
V16	0.34159	0.27480	0.27137	0.14817	1.00000	0.24643	0.29413	0.00082	0.17246	-0.02033
V17	0.15419	0.11532	0.33247	0.06484	0.24643	1.00000	0.19504	0.03757	0.05968	-0.09153
V18	0.19712	0.16287	0.18364	0.58249	0.29413	0.19504	1.00000	-0.00069	0.14873	-0.03322
V20	0.26915	0.51304	0.22286	0.19623	0.00082	0.03757	-0.00069	1.00000	0.39481	0.28300
V21	0.21802	0.37427	0.68326	0.29534	0.17246	0.05968	0.14873	0.39481	1.00000	0.27802
V22	0.25271	0.25089	0.21544	0.57753	-0.02033	-0.09153	-0.03322	0.28300	0.27802	1.00000
V24	0.04602	-0.09536	0.00484	0.14168	-0.07619	-0.04580	0.03671	-0.07354	-0.00181	0.04951
V25	0.27998	0.39637	0.17973	0.23646	0.09447	0.03209	0.13216	0.19822	0.14923	0.21510
V26	0.18950	0.16137	0.51072	0.08620	0.17694	0.13135	0.07920	-0.01998	0.21297	0.04415
V27	0.10940	0.03588	0.10493	0.41144	-0.06368	-0.07570	0.05472	0.06802	0.19259	0.49716
V30	0.20722	0.37580	0.12578	0.18672	0.08553	-0.05577	0.02058	0.33725	0.17780	0.28029
V34	0.22887	0.11578	0.10002	0.24197	0.34147	0.14144	0.32276	-0.00770	-0.00922	0.07838
V35	0.35913	0.46888	0.29120	0.24596	-0.02264	-0.01451	0.00763	0.60840	0.46575	0.28944
V36	0.00152	-0.14495	-0.12389	-0.14787	0.00593	-0.06727	-0.09293	-0.14753	-0.10465	-0.10724
V37	0.37485	0.33917	0.19516	0.16904	0.06170	0.02566	-0.02260	0.49343	0.38028	0.16630
V38	-0.03932	-0.16667	-0.06588	-0.02563	0.09799	0.06366	0.12191	-0.23906	-0.25310	-0.08259
V39	0.01642	-0.31606	-0.30264	-0.23476	-0.04884	-0.10704	-0.25354	-0.29286	-0.34522	-0.10666
V40	0.38661	0.32721	0.20542	0.16455	0.04449	0.01042	-0.00807	0.44984	0.35851	0.12707
V41	-0.04251	-0.03441	0.02012	0.03944	0.15714	0.08415	0.16544	-0.11014	-0.11790	-0.00984
V42	0.20186	0.23437	0.08106	0.08415	0.04266	-0.06973	0.01409	0.18957	0.09095	0.07775
V43	-0.02318	0.07983	0.04471	-0.03761	-0.04448	-0.00268	0.03196	0.02863	0.12661	0.02468
V52	0.09304	-0.03160	-0.07244	0.05770	-0.05184	-0.01328	-0.03739	0.15785	0.00944	0.00951
V53	0.19781	0.23952	0.15136	0.11734	0.04694	-0.03519	-0.02458	0.11811	0.21216	0.17485
V54	0.07656	-0.03925	0.06527	0.02455	-0.03655	0.01656	-0.00713	0.03313	0.03383	0.04992
V55	0.08856	0.09529	0.05774	0.09681	-0.08561	-0.01325	0.07808	0.14759	0.02875	0.21815
V56	0.00871	-0.05077	0.04882	-0.02493	0.10999	-0.04364	0.05461	0.08449	0.08207	-0.08284
V57	0.73362	0.19994	0.17472	0.33074	0.28428	0.10386	0.19972	0.12013	0.15087	0.19056
V58	-0.48683	-0.21833	-0.15290	-0.12398	-0.27531	-0.10891	-0.08215	-0.27917	-0.13740	-0.08875
V59	0.42164	0.46842	0.30833	0.41535	0.26795	0.12973	0.21342	0.47286	0.32976	0.32689
V60	-0.26379	-0.12206	-0.12872	-0.11881	-0.08251	0.00984	-0.00137	-0.18225	-0.16797	-0.14396
OVASS	0.49942	0.29770	0.14162	0.36568	0.22760	0.01187	0.21791	0.22513	0.18076	0.24060
AGE	0.17499	0.16745	0.21856	0.13133	0.20989	0.20161	0.15535	0.18827	0.20616	-0.01581
SEX	-0.15616	-0.04392	-0.03235	-0.07855	0.04204	-0.01120	-0.05031	-0.07024	0.01781	-0.02779

	V24	V25	V26	V27	V30	V34	V35	V36	V37	V38
V1	0.04602	0.27998	0.18950	0.10940	0.20722	0.22887	0.35913	0.00152	0.37485	-0.03932
V3	-0.09536	0.39637	0.16137	0.03588	0.37580	0.11578	0.46888	-0.14495	0.33917	-0.16667
V4	0.00484	0.17973	0.51072	0.10493	0.12578	0.10002	0.29120	-0.12389	0.19516	-0.06588
V5	0.14168	0.23646	0.08620	0.41144	0.18672	0.24197	0.24596	-0.14787	0.16904	-0.02563
V16	-0.07619	0.09447	0.17694	-0.06368	0.08553	0.34147	-0.02264	0.00593	0.06170	0.09799
V17	-0.04580	0.03209	0.13135	-0.07570	-0.05577	0.14144	-0.01451	-0.06727	0.02566	0.06366
V18	0.03671	0.13216	0.07920	0.05472	0.02058	0.32276	0.00763	-0.09293	-0.02260	0.12191
V20	-0.07354	0.19822	-0.01998	0.06802	0.33725	-0.00770	0.60840	-0.14753	0.49343	-0.23906
V21	-0.00181	0.14923	0.21297	0.19259	0.17780	-0.00922	0.46575	-0.10465	0.38028	-0.25310
V22	0.04951	0.21510	0.04415	0.49716	0.28029	0.07838	0.28944	-0.10724	0.16630	-0.08259
V24	1.00000	0.02589	0.07766	0.29214	-0.08355	-0.03542	0.10409	-0.09600	0.05039	0.01101
V25	0.02589	1.00000	0.16370	0.08624	0.68586	0.32546	0.17821	-0.02409	0.09850	0.02307
V26	0.07766	0.16370	1.00000	0.08027	0.10504	0.07267	0.14112	0.01600	0.02805	0.04289
V27	0.29214	0.08624	0.08027	1.00000	0.04462	0.09204	0.13839	-0.13209	0.12388	-0.01283
V30	-0.08355	0.68586	0.10504	0.04462	1.00000	0.33108	0.31365	-0.01119	0.24808	-0.10611
V34	-0.03542	0.32546	0.07267	0.09204	0.33108	1.00000	-0.28186	-0.08918	-0.19849	0.44760
V35	0.10409	0.17821	0.14112	0.13839	0.31365	-0.28186	1.00000	-0.06723	0.72097	-0.44449
V36	-0.09600	-0.02409	0.01600	-0.13209	-0.01119	-0.08918	-0.06723	1.00000	-0.08336	-0.11609
V37	0.05039	0.09850	0.02805	0.12388	0.24808	-0.19849	0.72097	-0.08336	1.00000	-0.72783
V38	0.01101	0.02307	0.04289	-0.01283	-0.10611	0.44760	-0.44449	-0.11609	-0.72783	1.00000
V39	0.01965	-0.22430	-0.14014	-0.11877	-0.26221	-0.29533	-0.29974	0.17882	-0.19663	0.13136
V40	0.07139	0.13881	0.09691	0.12321	0.25210	-0.19431	0.71499	-0.06178	0.90208	-0.64416
V41	-0.01289	0.07014	0.00644	0.00332	0.00311	0.53533	-0.35841	-0.06920	-0.59225	0.84643
V42	-0.09548	0.09220	-0.02510	-0.02067	0.21237	0.14727	0.23407	0.04653	0.25342	-0.19557
V43	-0.15508	0.12622	0.03145	-0.02003	0.10044	-0.00697	0.09776	0.05387	0.03663	-0.07570
V52	-0.01084	0.01987	-0.11852	0.00967	0.11778	0.03641	0.10406	0.06063	0.15657	-0.11362
V53	-0.01584	0.23928	0.06488	0.10440	0.40343	0.11646	0.22483	-0.02555	0.23161	-0.14368
V54	0.19744	-0.03024	0.00876	0.10260	-0.03327	-0.00375	0.05357	-0.18727	0.11399	-0.01761
V55	-0.03003	0.00240	0.00640	0.04100	0.15087	0.14692	0.12769	-0.03307	0.09631	-0.02215
V56	-0.00276	0.00957	0.00256	-0.01781	0.07142	-0.04614	0.05397	0.07143	0.05819	-0.04325
V57	0.16083	0.24893	0.14725	0.16173	0.04294	0.22283	0.13284	-0.03606	0.09993	0.06894
V58	-0.00858	-0.15320	-0.07735	-0.06213	-0.16479	-0.31818	-0.30110	-0.03576	-0.31333	-0.30930
V59	0.00211	0.41395	0.10977	0.15466	0.38446	0.32360	0.36377	-0.17599	0.34909	-0.00311
V60	0.03134	-0.02382	-0.05576	-0.09007	-0.07512	-0.12404	-0.15638	-0.00915	-0.19066	-0.04271
OVASS	0.09839	0.36429	0.09418	0.16249	0.29389	0.29447	0.20641	-0.07521	0.16370	-0.00379
AGE	-0.09590	0.10959	0.00215	-0.03290	0.14879	0.07846	0.17098	-0.12953	0.23888	-0.06872
SEX	0.09407	0.04185	0.08072	-0.01147	0.03639	-0.02240	-0.03661	-0.00358	-0.04740	-0.00057

	V39	V40	V41	V42	V43	V52	V53	V54	V55	V56
V1	0.01642	0.38661	-0.04251	0.20186	-0.02318	0.09304	0.19781	0.07656	0.08856	0.00871
V3	-0.31606	0.32721	-0.03441	0.23437	0.07983	-0.03160	0.23952	-0.03925	0.09529	-0.05077
V4	-0.30264	0.20542	0.02012	0.08106	0.04471	-0.07244	0.15136	0.06527	0.05774	0.04882
V5	-0.23476	0.16455	0.03944	0.08415	-0.03761	0.05770	0.11734	0.02455	0.09681	-0.02493
V16	-0.04884	0.04449	0.15714	0.04266	-0.04448	-0.05184	0.04694	-0.03655	-0.08561	0.10999
V17	-0.10704	0.01042	0.08415	-0.06973	-0.00268	-0.01328	-0.03519	0.01656	-0.01325	-0.04364
V18	-0.25354	-0.00807	0.16544	0.01409	0.03196	-0.03739	-0.02458	-0.00713	0.07808	0.05461
V20	-0.29286	0.44984	-0.11014	0.18957	0.02863	0.15785	0.11811	0.03313	0.14759	0.08449
V21	-0.34522	0.35851	-0.11790	0.09095	0.12661	0.00944	0.21216	0.03383	0.02875	0.08207
V22	-0.10666	0.12707	-0.00984	0.07775	0.02468	0.00951	0.17485	0.04992	0.21815	-0.08284
V24	0.01965	0.07139	-0.01289	-0.09548	-0.15508	-0.01084	-0.01584	0.19744	-0.03003	-0.00276
V25	-0.22430	0.13881	0.07014	0.09220	0.12622	0.01987	0.23928	-0.03024	0.00240	0.00957
V26	-0.14014	0.09691	0.00644	-0.02510	0.03145	-0.11852	0.06488	0.00876	0.00640	0.00256
V27	-0.11877	0.12321	0.00332	-0.02067	-0.02003	0.00967	0.10440	0.10260	0.04100	-0.01781
V30	-0.26221	0.25210	0.00311	0.21237	0.10044	0.11778	0.40343	-0.03327	0.15087	0.07142
V34	-0.29533	-0.19431	0.53533	0.14727	-0.00697	0.03641	0.11646	-0.00375	0.14692	-0.04614
V35	-0.29974	0.71499	-0.35841	0.23407	0.09776	0.10406	0.22483	0.05357	0.12769	0.05397
V36	0.17882	-0.06178	-0.06920	0.04653	0.05387	0.06063	-0.02555	-0.18727	-0.03307	0.07143
V37	-0.19663	0.90208	-0.59225	0.25342	0.03663	0.15657	0.23161	0.11399	0.09631	0.05819
V38	0.13136	-0.64416	0.84643	-0.19557	-0.07570	-0.11362	-0.14368	-0.01761	-0.02215	-0.04325
V39	1.00000	-0.25704	-0.10692	-0.24409	-0.07033	-0.01063	-0.12452	0.06525	-0.14240	-0.05082
V40	-0.25704	1.00000	-0.66030	0.29035	0.05082	0.13698	0.23241	0.10451	0.06803	0.04019
V41	-0.10692	-0.66030	1.00000	-0.16428	-0.04777	-0.06619	-0.09760	-0.05826	0.01801	-0.00245
V42	-0.24409	0.29035	-0.16428	1.00000	0.15988	0.01631	0.30194	-0.16712	0.12305	-0.07289
V43	-0.07033	0.05082	-0.04777	0.15988	1.00000	0.05022	0.21239	-0.01619	0.06535	-0.05337
V52	-0.01063	0.13698	-0.06619	0.01631	0.05022	1.00000	0.06243	-0.04471	-0.01467	-0.06206
V53	-0.12452	0.23241	-0.09760	0.30194	0.21239	0.06243	1.00000	0.08442	0.18096	0.01809
V54	0.06525	0.10451	-0.05826	-0.16712	-0.01619	-0.04471	0.08442	1.00000	0.11500	0.06143
V55	-0.14240	0.06803	0.01801	0.12305	0.06535	-0.01467	0.18096	0.11500	1.00000	-0.05616
V56	-0.05082	0.04019	-0.00245	-0.07289	-0.05337	-0.06206	0.01809	0.06143	-0.05616	1.00000
V57	0.04106	0.09342	0.05773	0.04376	-0.09845	-0.03011	0.12223	0.15153	-0.02085	0.01902
V58	-0.07347	-0.28754	-0.31666	-0.10604	-0.03006	-0.07534	-0.05431	-0.06380	-0.03714	-0.01941
V59	-0.28495	0.31361	0.11948	0.26342	0.01244	0.03866	0.18224	0.01245	0.14115	0.08313
V60	0.03683	-0.18398	-0.05742	-0.04854	0.04985	-0.08778	-0.09002	-0.09558	-0.01126	-0.02638
OVASS	-0.22614	0.22984	0.02956	0.21094	0.04067	0.04579	0.24164	0.09216	0.07266	0.03912
AGE	-0.21476	0.16292	0.02466	0.04245	-0.01783	0.16782	0.14193	0.03171	-0.01611	-0.01742
SEX	0.02098	0.01347	-0.03283	0.00386	0.07569	-0.01847	0.00395	-0.05951	-0.11556	-0.09810

	V57	V58	V59	V60	OVASS	AGE	SEX
V1	0.73362	-0.48683	0.42164	-0.26379	0.49942	0.17499	-0.15616
V3	0.19994	-0.21833	0.46842	-0.12206	0.29770	0.16745	-0.04392
V4	0.17472	-0.15290	0.30833	-0.12872	0.14162	0.21856	-0.03235
V5	0.33074	-0.12398	0.41535	-0.11881	0.36568	0.13133	-0.07855
V16	0.28428	-0.27531	0.26795	-0.08251	0.22760	0.20989	0.04204
V17	0.10386	-0.10891	0.12973	0.00984	0.01187	0.20161	-0.01120
V18	0.19972	-0.08215	0.21342	-0.00137	0.21791	0.15535	-0.05031
V20	0.12013	-0.27917	0.47286	-0.18225	0.22513	0.18827	-0.07024
V21	0.15087	-0.13740	0.32976	-0.16797	0.18076	0.20616	0.01781
V22	0.19056	-0.08875	0.32689	-0.14396	0.24060	-0.01581	-0.02779
V24	0.16083	-0.00858	0.00211	0.03134	0.09839	-0.09590	0.09407
V25	0.24893	-0.15320	0.41395	-0.02382	0.36429	0.10959	0.04185
V26	0.14725	-0.07735	0.10977	-0.05576	0.09418	0.00215	0.08072
V27	0.16173	-0.06213	0.15466	-0.09007	0.16249	-0.03290	-0.01147
V30	0.04294	-0.16479	0.38446	-0.07512	0.29389	0.14879	0.03639
V34	0.22283	-0.31818	0.32360	-0.12404	0.29447	0.07846	-0.02240
V35	0.13284	-0.30110	0.36377	-0.15638	0.20641	0.17098	-0.03661
V36	-0.03606	-0.03576	-0.17599	-0.00915	-0.07521	-0.12953	-0.00358
V37	0.09993	-0.31333	0.34909	-0.19066	0.16370	0.23888	-0.04740
V38	0.06894	-0.30930	-0.00311	-0.04271	-0.00379	-0.06872	-0.00057
V39	0.04106	-0.07347	-0.28495	0.03683	-0.22614	-0.21476	0.02098
V40	0.09342	-0.28754	0.31361	-0.18398	0.22984	0.16292	0.01347
V41	0.05773	-0.31666	0.11948	-0.05742	0.02956	0.02466	-0.03283
V42	0.04376	-0.10604	0.26342	-0.04854	0.21094	0.04245	0.00386
V43	-0.09845	-0.03006	0.01244	0.04985	0.04067	-0.01783	0.07569
V52	-0.03011	-0.07534	0.03866	-0.08778	0.04579	0.16782	-0.01847
V53	0.12223	-0.05431	0.18224	-0.09002	0.24164	0.14193	0.00395
V54	0.15153	-0.06380	0.01245	-0.09558	0.09216	0.03171	-0.05951
V55	-0.02085	-0.03714	0.14115	-0.01126	0.07266	-0.01611	-0.11556
V56	0.01902	-0.01941	0.08313	-0.02638	0.03912	-0.01742	-0.09810
V57	1.00000	-0.25798	0.30558	-0.12165	0.53659	0.03396	-0.05984
V58	-0.25798	1.00000	-0.41991	0.34223	-0.19794	-0.13177	0.05037
V59	0.30558	-0.41991	1.00000	0.16717	0.37191	0.22673	-0.04178
V60	-0.12165	0.34223	0.16717	1.00000	-0.15129	-0.00214	0.12744
OVASS	0.53659	-0.19794	0.37191	-0.15129	1.00000	0.01521	-0.01965
AGE	0.03396	-0.13177	0.22673	-0.00214	0.01521	1.00000	-0.27504
SEX	-0.05984	0.05037	-0.04178	0.12744	-0.01965	-0.27504	1.00000

APPENDIX 11
COMMUNALITIES AND EIGENVALUES FOR SPLIT SAMPLE A

VARIABLE	EST COMMUNALITY	FACTOR	EIGENVALUE	PCT OF VAR	CUM PCT
V1	0.76681	1	6.54928	17.7	17.7
V3	0.47754	2	3.90786	10.6	28.3
V4	0.71961	3	2.86439	7.7	36.0
V5	0.79946	4	1.94446	5.3	41.3
V16	0.45302	5	1.73994	4.7	46.0
V17	0.53366	6	1.58002	4.3	50.2
V18	0.71548	7	1.52919	4.1	54.4
V20	0.58405	8	1.38209	3.7	58.1
V21	0.60945	9	1.22025	3.3	61.4
V22	0.74754	10	1.10827	3.0	64.4
V24	0.28957	11	1.09476	3.0	67.4
V25	0.62880	12	1.04191	2.8	70.2
V26	0.33691	13	1.00027	2.7	72.9
V27	0.48062	14	0.90326	2.4	75.3
V30	0.62425	15	0.86647	2.3	77.7
V34	0.61343	16	0.84161	2.3	79.9
V35	0.72162	17	0.72689	2.0	81.9
V36	0.64131	18	0.69429	1.9	83.8
V37	0.93195	19	0.66690	1.8	85.6
V38	0.94257	20	0.60633	1.6	87.2
V39	0.73327	21	0.56445	1.5	88.7
V40	0.96648	22	0.51423	1.4	90.1
V41	0.97156	23	0.49843	1.3	91.5
V42	0.42017	24	0.43828	1.2	92.7
V43	0.20895	25	0.41121	1.1	93.8
V52	0.26634	26	0.39302	1.1	94.8
V53	0.31663	27	0.33772	0.9	95.7
V54	0.34025	28	0.30420	0.8	96.6
V55	0.24359	29	0.23828	0.6	97.2
V56	0.20374	30	0.21845	0.6	97.8
V57	0.74283	31	0.20148	0.5	98.3
V58	0.44238	32	0.18415	0.5	98.8
V59	0.69817	33	0.15984	0.4	99.3
V60	0.52231	34	0.13402	0.4	99.6
OVASS	0.57672	35	0.08249	0.2	99.9
AGE	0.42027	36	0.03635	0.1	100.0
SEX	0.25420	37	0.01470	0.0	100.0

APPENDIX 11

COMMUNALITY AND EIGENVALUES OF SPLIT SAMPLE B

VARIABLE	EST COMMUNALITY	FACTOR	EIGENVALUE	PCT OF VAR	CUM PCT
V1	0.77974	1	6.72471	18.2	18.2
V3	0.55060	2	3.85876	10.4	28.6
V4	0.71311	3	2.09918	5.7	34.3
V5	0.75989	4	2.00281	5.4	39.7
V16	0.43682	5	1.91442	5.2	44.9
V17	0.29222	6	1.58409	4.3	49.1
V18	0.63229	7	1.45255	3.9	53.1
V20	0.59193	8	1.28135	3.5	56.5
V21	0.65830	9	1.23945	3.3	59.9
V22	0.67390	10	1.18066	3.2	63.1
V24	0.26410	11	1.14190	3.1	66.2
V25	0.63153	12	1.10447	3.0	69.1
V26	0.41417	13	0.98548	2.7	71.8
V27	0.40801	14	0.95846	2.6	74.4
V30	0.68986	15	0.91351	2.5	76.9
V34	0.71815	16	0.86034	2.3	79.2
V35	0.79332	17	0.81808	2.2	81.4
V36	0.42800	18	0.73310	2.0	83.4
V37	0.96080	19	0.68448	1.8	85.2
V38	0.94921	20	0.64509	1.7	87.0
V39	0.74327	21	0.58194	1.6	88.6
V40	0.94518	22	0.56081	1.5	90.1
V41	0.92764	23	0.52527	1.4	91.5
V42	0.38078	24	0.47657	1.3	92.8
V43	0.21452	25	0.42482	1.1	93.9
V52	0.16908	26	0.37960	1.0	95.0
V53	0.35655	27	0.34978	0.9	95.9
V54	0.20301	28	0.30928	0.8	96.7
V55	0.24421	29	0.24409	0.7	97.4
V56	0.17038	30	0.19033	0.5	97.9
V57	0.70959	31	0.17586	0.5	98.4
V58	0.84688	32	0.15219	0.4	98.8
V59	0.70776	33	0.13548	0.4	99.2
V60	0.48499	34	0.12357	0.3	99.5
OVASS	0.47864	35	0.11964	0.3	99.8
AGE	0.36374	36	0.05075	0.1	100.0
SEX	0.22723	37	0.01688	0.0	100.0

APPENDIX 12
IMAGE FACTOR ANALYSIS MATRICES

ANTI-IMAGE COVARIANCE MATRIX..

	V1	V3	V4	V5	V16	V17	V18	V20	V21	V22
V1	0.25654	-0.00027	-0.00421	-0.00985	-0.04373	-0.02106	-0.00180	-0.00468	0.01228	-0.01251
V3	-0.00027	0.54329	-0.02792	-0.01752	-0.10761	0.02413	-0.00540	-0.10836	0.00474	0.02391
V4	-0.00421	-0.02792	0.32069	-0.02073	-0.01989	-0.19479	0.02836	0.00224	-0.23034	0.01034
V5	-0.00985	-0.01752	-0.02073	0.24742	0.06584	-0.01475	-0.20942	0.04689	0.01406	-0.18942
V16	-0.04373	-0.10761	-0.01989	0.06584	0.61852	-0.06944	-0.11767	0.08397	0.02216	-0.03042
V17	-0.02106	0.02413	-0.19479	-0.01475	-0.06944	0.65440	-0.02958	-0.00830	0.11648	0.02786
V18	-0.00180	-0.00540	0.02836	-0.20942	-0.11767	-0.02958	0.37169	-0.03764	-0.03298	0.19706
V20	-0.00468	-0.10836	0.00224	0.04689	0.08397	-0.00830	-0.03764	0.46757	-0.01009	-0.03095
V21	0.01228	0.00474	-0.23034	0.01406	0.02216	0.11648	-0.03298	-0.01009	0.40549	-0.02967
V22	-0.01251	0.02391	0.01034	-0.18942	-0.03042	0.02786	0.19706	-0.03095	-0.02967	0.34233
V24	0.01068	0.03009	0.01485	-0.06489	0.00172	0.02659	0.06213	0.02294	0.01811	0.05230
V25	0.01168	-0.08647	-0.02261	0.02533	0.06662	0.01449	-0.03549	0.09547	0.02333	0.00496
V26	-0.02488	-0.00707	-0.21230	0.01555	-0.00354	0.12689	-0.02482	0.06073	0.10958	-0.00328
V27	0.01882	0.03127	0.01297	-0.04839	0.00385	0.02025	-0.00177	0.00108	0.00459	-0.13169
V30	-0.01351	-0.00628	0.03965	-0.01180	-0.02386	0.00819	0.05027	-0.03555	-0.02914	-0.00164
V34	-0.02204	0.00287	-0.00788	0.01038	-0.05191	-0.01787	-0.05419	0.00474	0.01045	-0.00612
V35	-0.02661	-0.03903	0.00108	-0.00240	0.01052	0.00321	-0.02149	-0.08347	-0.03225	-0.02541
V36	-0.01345	0.06159	0.02782	-0.01218	0.02440	-0.05391	0.02919	-0.02335	-0.00635	0.04295
V37	0.00592	0.01992	0.00989	-0.00555	0.01373	-0.01678	0.00583	-0.01064	-0.00305	0.01635
V38	0.00544	0.01896	0.00609	0.00206	0.01812	-0.00894	0.00117	0.00013	0.00823	0.00847
V39	-0.04668	0.00582	-0.01191	-0.00149	-0.03364	0.03536	0.02414	0.01449	0.02279	0.00490
V40	-0.01549	-0.00886	-0.01053	0.00322	-0.00595	0.02332	0.00757	0.00629	0.00775	0.00338
V41	-0.00517	-0.00516	-0.00674	-0.00392	-0.01206	0.01563	0.00932	-0.00104	0.00103	0.00675
V42	-0.05630	-0.02927	-0.00347	0.03290	0.01110	0.05404	-0.01158	-0.00586	0.05176	-0.01932
V43	0.00113	-0.05980	0.03609	0.00509	0.01221	-0.04286	0.01513	0.00065	-0.04680	-0.01592
V52	-0.02428	0.04131	-0.00176	-0.02940	0.07765	0.05675	0.03261	-0.05628	0.00375	0.04718
V53	-0.00619	-0.01072	0.01522	0.00390	-0.01546	-0.01850	-0.00962	0.01635	-0.04837	-0.00832
V54	0.02958	0.01635	-0.00253	0.00550	0.03607	0.00754	-0.01116	0.00179	0.03753	0.01725
V55	-0.06020	0.00179	-0.05076	0.05925	0.02944	-0.02035	-0.04914	-0.01301	0.04974	-0.05110
V56	-0.02226	-0.01628	-0.01952	-0.00789	-0.04616	0.07147	0.01279	-0.00143	0.00116	0.01326
V57	-0.18036	-0.00537	-0.00259	0.00847	-0.00462	-0.00731	-0.00119	0.00860	-0.01439	-0.00084
V58	0.01474	0.00740	-0.00276	-0.01083	0.01781	0.00268	0.01226	-0.00697	0.00894	0.01697
V59	-0.02053	-0.06170	-0.00032	-0.05472	-0.05032	-0.02541	0.02984	-0.11328	-0.03110	-0.01409
V60	0.03980	0.04529	0.00374	0.03685	0.04627	0.00138	-0.03625	0.08011	0.03337	0.01160
OVASS	-0.02969	-0.00264	0.01823	-0.03513	-0.01522	0.01115	0.00854	-0.02902	-0.01843	0.02391
SEX	0.07120	0.02210	0.02622	0.00608	-0.04943	-0.04420	-0.01770	-0.00697	-0.02153	-0.02541
AGE	-0.02041	0.00178	-0.03465	-0.03504	-0.13618	-0.04913	0.03140	-0.02756	-0.00636	0.02606

	V24	V25	V26	V27	V30	V34	V35	V36	V37	V38
V1	0.01068	0.01168	-0.02488	0.01882	-0.01351	-0.02204	-0.02661	-0.01345	0.00592	0.00544
V3	0.03009	-0.08647	-0.00707	0.03127	-0.00628	0.00287	-0.03903	0.06159	0.01992	0.01896
V4	0.01485	-0.02261	-0.21230	0.01297	0.03965	-0.00788	0.00108	0.02782	0.00989	0.00609
V5	-0.06489	0.02533	0.01555	-0.04839	-0.01180	0.01038	-0.00240	-0.01218	-0.00555	0.00206
V16	0.00172	0.06662	-0.00354	0.00385	-0.02386	-0.05191	0.01052	0.02440	0.01373	0.01812
V17	0.02659	0.01449	0.12689	0.02025	0.00819	-0.01787	0.00321	-0.05391	-0.01678	-0.00894
V18	0.06213	-0.03549	-0.02482	-0.00177	0.05027	-0.05419	-0.02149	0.02919	0.00583	0.00117
V20	0.02294	0.09547	0.06073	0.00108	-0.03555	0.00474	-0.08347	-0.02335	-0.01064	0.00013
V21	0.01811	0.02333	0.10958	0.00459	-0.02914	0.01045	-0.03225	-0.00635	-0.00305	0.00823
V22	0.05230	0.00496	-0.00328	-0.13169	-0.00164	-0.00612	-0.02541	0.04295	0.01635	0.00847
V24	0.79350	-0.02252	-0.02688	-0.04636	0.04807	-0.01628	-0.01185	-0.02205	-0.00858	-0.00478
V25	-0.02252	0.42614	-0.01238	-0.00140	-0.25238	-0.01040	-0.00726	-0.00240	0.00038	-0.00863
V26	-0.02688	-0.01238	0.68560	-0.00648	-0.00930	-0.00862	-0.03191	-0.03763	-0.01157	-0.02246
V27	-0.04636	-0.00140	-0.00648	0.62734	0.01616	-0.02707	-0.00864	-0.01455	-0.02063	-0.01895
V30	0.04807	-0.25238	-0.00930	0.01616	0.40012	-0.06061	-0.03852	-0.01428	-0.00290	0.00902
V34	-0.01628	-0.01040	-0.00862	-0.02707	-0.06061	0.37409	0.15710	-0.00308	-0.01095	-0.01643
V35	-0.01185	-0.00726	-0.03191	-0.00864	-0.03852	0.15710	0.26880	0.01282	-0.01823	-0.00673
V36	-0.02205	-0.00240	-0.03763	-0.01455	-0.01428	-0.00308	0.01282	0.57452	0.08061	0.08749
V37	-0.00858	0.00038	-0.01157	-0.02063	-0.00290	-0.01095	-0.01823	0.08061	0.05730	0.04790
V38	-0.00478	-0.00863	-0.02246	-0.01895	0.00902	-0.01643	-0.00673	0.08749	0.04790	0.06163
V39	-0.01148	0.01309	0.04705	0.01106	-0.00138	0.07705	0.04077	0.01276	-0.03124	-0.03785
V40	-0.01819	0.00036	0.01280	-0.00479	0.00785	-0.00641	-0.01319	-0.00152	-0.02939	-0.02245
V41	-0.01768	0.00980	0.01877	-0.00028	-0.00514	-0.01235	-0.00879	0.00474	-0.02036	-0.03194
V42	0.03942	0.04500	0.04517	0.03683	-0.01636	-0.05022	-0.03186	0.01234	0.00098	0.00492
V43	0.05226	-0.00882	-0.02399	0.01438	0.04739	-0.05434	-0.03435	-0.01205	0.00564	0.01314
V52	0.01847	0.01487	0.04904	-0.00562	0.00757	-0.07643	-0.02993	-0.03168	-0.00123	0.00483
V53	0.01574	-0.01855	-0.01872	-0.04384	-0.08133	-0.02085	-0.01386	-0.05406	-0.00153	-0.00878
V54	-0.09386	-0.02503	-0.00723	-0.04309	0.06713	0.00648	-0.01550	0.08289	-0.00779	0.00123
V55	0.00766	0.03864	0.02345	-0.01985	-0.05667	-0.06204	-0.03523	-0.04807	-0.00407	-0.00258
V56	0.03775	0.04453	-0.00685	0.01491	-0.01487	-0.00018	-0.00060	-0.10624	-0.01024	-0.00729
V57	-0.05996	-0.02868	0.00767	-0.03424	0.05965	-0.00969	0.00298	0.00621	-0.00685	-0.00094
V58	-0.02667	-0.00131	-0.00345	-0.02959	0.00001	0.01054	0.00998	0.15403	0.04188	0.04554
V59	0.03250	-0.06479	0.00793	0.00945	-0.00043	-0.05096	-0.00136	0.00696	-0.01224	-0.00651
V60	-0.05921	0.01428	0.00209	-0.00226	0.01387	0.04395	-0.00623	0.00806	0.01429	0.01144
OVASS	0.00778	-0.05832	-0.02311	0.02684	-0.00608	-0.01518	0.01101	0.03679	0.00972	-0.00365
SEX	-0.04284	-0.01206	-0.10620	0.03173	-0.04645	0.03251	0.03530	0.02018	0.00604	0.00273
AGE	0.09220	0.01171	0.01157	0.06722	-0.05368	0.02225	0.02219	0.00946	-0.03180	-0.02702

	V39	V40	V41	V42	V43	V52	V53	V54	V55	V56
V1	-0.04668	-0.01549	-0.00517	-0.05630	0.00113	-0.02428	-0.00619	0.02958	-0.06020	-0.02226
V3	0.00582	-0.00886	-0.00516	-0.02927	-0.05980	0.04131	-0.01072	0.01635	0.00179	-0.01628
V4	-0.01191	-0.01053	-0.00674	-0.00347	0.03609	-0.00176	0.01522	-0.00253	-0.05076	-0.01952
V5	-0.00149	0.00322	-0.00392	0.03290	0.00509	-0.02940	0.00390	0.00550	0.05925	-0.00789
V16	-0.03364	-0.00595	-0.01206	0.01110	0.01221	0.07765	-0.01546	0.03607	0.02944	-0.04616
V17	0.03536	0.02332	0.01563	0.05404	-0.04286	0.05675	-0.01850	0.00754	-0.02035	0.07147
V18	0.02414	0.00757	0.00932	-0.01158	0.01513	0.03261	-0.00962	-0.01116	-0.04914	0.01279
V20	0.01449	0.00629	-0.00104	-0.00586	0.00065	-0.05628	0.01635	0.00179	-0.01301	-0.00143
V21	0.02279	0.00775	0.00103	0.05176	-0.04680	0.00375	-0.04837	0.03753	0.04974	0.00116
V22	0.00490	0.00338	0.00675	-0.01932	-0.01592	0.04718	-0.00832	0.01725	-0.05110	0.01326
V24	-0.01148	-0.01819	-0.01768	0.03942	0.05226	0.01847	0.01574	-0.09386	0.00766	0.03775
V25	0.01309	0.00036	0.00980	0.04500	-0.00882	0.01487	-0.01855	-0.02503	0.03864	0.04453
V26	0.04705	0.01280	0.01877	0.04517	-0.02399	0.04904	-0.01872	-0.00723	0.02345	-0.00685
V27	0.01106	-0.00479	-0.00028	0.03683	0.01438	-0.00562	-0.04384	-0.04309	-0.01985	0.01491
V30	-0.00138	0.00785	-0.00514	-0.01636	0.04739	0.00757	-0.08133	0.06713	-0.05667	-0.01487
V34	0.07705	-0.00641	-0.01235	-0.05022	-0.05434	-0.07643	-0.02085	0.00648	-0.06204	-0.00018
V35	0.04077	-0.01319	-0.00879	-0.03186	-0.03435	-0.02993	-0.01386	-0.01550	-0.03523	-0.00060
V36	0.01276	-0.00152	0.00474	0.01234	-0.01205	-0.03168	-0.05406	0.08289	-0.04807	-0.10624
V37	-0.03124	-0.02939	-0.02036	0.00098	0.00564	-0.00123	-0.00153	-0.00779	-0.00407	-0.01024
V38	-0.03785	-0.02245	-0.03194	0.00492	0.01314	0.00483	-0.00878	0.00123	-0.00258	-0.00729
V39	0.32416	0.08747	0.09455	0.08007	0.00085	-0.03465	-0.03766	-0.00320	0.00737	0.02209
V40	0.08747	0.06102	0.05148	0.02716	0.00588	-0.00119	-0.01852	0.01053	0.00439	0.00666
V41	0.09455	0.05148	0.06564	0.03538	-0.00092	-0.00444	-0.01224	0.01293	-0.00307	-0.00062
V42	0.08007	0.02716	0.03538	0.66181	-0.02878	0.07661	-0.17410	0.12682	0.00043	0.06700
V43	0.00085	0.00588	-0.00092	-0.02878	0.89399	-0.05077	-0.09898	-0.03419	0.03159	0.06835
V52	-0.03465	-0.00119	-0.00444	0.07661	-0.05077	0.87261	-0.02006	0.07440	0.01889	-0.03110
V53	-0.03766	-0.01852	-0.01224	-0.17410	-0.09898	-0.02006	0.73708	-0.09854	-0.05457	-0.02940
V54	-0.00320	0.01053	0.01293	0.12682	-0.03419	0.07440	-0.09854	0.79347	-0.13588	-0.00763
V55	0.00737	0.00439	-0.00307	0.00043	0.03159	0.01889	-0.05457	-0.13588	0.84359	0.02201
V56	0.02209	0.00666	-0.00062	0.06700	0.06835	-0.03110	-0.02940	-0.00763	0.02201	0.93129
V57	-0.00266	0.02013	0.00713	0.04796	0.04161	0.02139	-0.01942	-0.02354	0.06684	0.00108
V58	0.11194	0.04200	0.04635	0.04351	0.02431	-0.01681	-0.04610	0.02007	-0.02069	-0.01338
V59	0.00503	-0.00495	-0.00916	-0.04239	0.02980	-0.01890	0.03720	-0.02600	0.00296	-0.01702
V60	-0.01813	0.00226	0.00318	0.00842	-0.06337	0.05100	-0.00290	0.05734	-0.03523	-0.01395
OVASS	0.01214	-0.02087	-0.00635	-0.06788	-0.04005	-0.02003	-0.01796	-0.06085	-0.03604	0.00763
SEX	-0.02374	-0.02335	-0.01174	-0.00684	0.00955	-0.10831	-0.04425	0.03624	0.01783	0.02079
AGE	0.04847	0.00764	0.01073	-0.02551	-0.00262	-0.10531	-0.03111	-0.06846	0.06918	0.03100

	V57	V58	V59	V60	OVASS	SEX	AGE
V1	-0.18036	0.01474	-0.02053	0.03980	-0.02969	0.07120	-0.02041
V3	-0.00537	0.00740	-0.06170	0.04529	-0.00264	0.02210	0.00178
V4	-0.00259	-0.00276	-0.00032	0.00374	0.01823	0.02622	-0.03465
V5	0.00847	-0.01083	-0.05472	0.03685	-0.03513	0.00608	-0.03504
V16	-0.00462	0.01781	-0.05032	0.04627	-0.01522	-0.04943	-0.13618
V17	-0.00731	0.00268	-0.02541	0.00138	0.01115	-0.04420	-0.04913
V18	-0.00119	0.01226	0.02984	-0.03625	0.00854	-0.01770	0.03140
V20	0.00860	-0.00697	-0.11328	0.08011	-0.02902	-0.00697	-0.02756
V21	-0.01439	0.00894	-0.03110	0.03337	-0.01843	-0.02153	-0.00636
V22	-0.00084	0.01697	-0.01409	0.01160	0.02391	-0.02541	0.02606
V24	-0.05996	-0.02667	0.03250	-0.05921	0.00778	-0.04284	0.09220
V25	-0.02868	-0.00131	-0.06479	0.01428	-0.05832	-0.01206	0.01171
V26	0.00767	-0.00345	0.00793	0.00209	-0.02311	-0.10620	0.01157
V27	-0.03424	-0.02959	0.00945	-0.00226	0.02684	0.03173	0.06722
V30	0.05965	0.00001	-0.00043	0.01387	-0.00608	-0.04645	-0.05368
V34	-0.00969	0.01054	-0.05096	0.04395	-0.01518	0.03251	0.02225
V35	0.00298	0.00998	-0.00136	-0.00623	0.01101	0.03530	0.02219
V36	0.00621	0.15403	0.00696	0.00806	0.03679	0.02018	0.00946
V37	-0.00685	0.04188	-0.01224	0.01429	0.00972	0.00604	-0.03180
V38	-0.00094	0.04554	-0.00651	0.01144	-0.00365	0.00273	-0.02702
V39	-0.00266	0.11194	0.00503	-0.01813	0.01214	-0.02374	0.04847
V40	0.02013	0.04200	-0.00495	0.00226	-0.02087	-0.02335	0.00764
V41	0.00713	0.04635	-0.00916	0.00318	-0.00635	-0.01174	0.01073
V42	0.04796	0.04351	-0.04239	0.00842	-0.06788	-0.00684	-0.02551
V43	0.04161	0.02431	0.02980	-0.06337	-0.04005	0.00955	-0.00262
V52	0.02139	-0.01681	-0.01890	0.05100	-0.02003	-0.10831	-0.10531
V53	-0.01942	-0.04610	0.03720	-0.00290	-0.01796	-0.04425	-0.03111
V54	-0.02354	0.02007	-0.02600	0.05734	-0.06085	0.03624	-0.06846
V55	0.06684	-0.02069	0.00296	-0.03523	-0.03604	0.01783	0.06918
V56	0.00108	-0.01338	-0.01702	-0.01395	0.00763	0.02079	0.03100
V57	0.29426	-0.00462	-0.01441	-0.01816	-0.11430	-0.03769	0.02061
V58	-0.00462	0.21139	0.02774	-0.05656	-0.02385	0.00746	-0.01334
V59	-0.01441	0.02774	0.37218	-0.21639	-0.02567	0.02644	0.02428
V60	-0.01816	-0.05656	-0.21639	0.66525	0.03817	-0.07485	-0.07567
OVASS	-0.11430	-0.02385	-0.02567	0.03817	0.51020	-0.01096	0.06839
SEX	-0.03769	0.00746	0.02644	-0.07485	-0.01096	0.82973	0.17506
AGE	0.02061	-0.01334	0.02428	-0.07567	0.06839	0.17506	0.68559

IMAGE COVARIANCE MATRIX..

	V1	V3	V4	V5	V16	V17	V18	V20	V21	V22
V1	0.74346	0.32446	0.27726	0.31348	0.27371	0.18009	0.22045	0.27034	0.24990	0.19946
V3	0.32446	0.45671	0.27865	0.20819	0.16120	0.14745	0.21638	0.33553	0.32531	0.12617
V4	0.27726	0.27865	0.67931	0.23779	0.20682	0.23174	0.23458	0.19340	0.43662	0.13786
V5	0.31348	0.20819	0.23779	0.75258	0.17035	0.14088	0.32502	0.22644	0.28663	0.40502
V16	0.27371	0.16120	0.20682	0.17035	0.38148	0.22136	0.22557	0.06735	0.10865	-0.10131
V17	0.18009	0.14745	0.23174	0.14088	0.22136	0.34560	0.22784	0.05051	0.26027	-0.02062
V18	0.22045	0.21638	0.23458	0.32502	0.22557	0.22784	0.62831	0.02710	0.11264	0.11233
V20	0.27034	0.33553	0.19340	0.22644	0.06735	0.05051	0.02710	0.53243	0.32796	0.16737
V21	0.24990	0.32531	0.43662	0.28663	0.10865	0.26027	0.11264	0.32796	0.59451	0.19508
V22	0.19946	0.12617	0.13786	0.40502	-0.10131	-0.02062	0.11233	0.16737	0.19508	0.65767
V24	0.05922	-0.10044	-0.06298	0.04559	-0.08219	-0.04884	0.04817	-0.09392	-0.08116	0.09622
V25	0.18981	0.26829	0.10751	0.10685	0.14757	0.03624	0.07932	0.15432	0.14811	0.01858
V26	0.10862	0.09915	0.20841	0.09752	0.11586	0.19551	0.09400	-0.01298	0.25095	0.00981
V27	0.16944	0.04725	0.05945	0.39777	-0.06246	-0.02520	0.07001	0.10172	0.10780	0.38520
V30	0.09353	0.32518	0.11072	0.03088	0.05329	-0.00529	0.04998	0.18343	0.13722	0.06646
V34	0.15468	0.09959	0.07795	0.13341	0.27454	0.14376	0.24267	-0.09026	-0.03041	-0.05994
V35	0.30172	0.38313	0.26448	0.25324	-0.03692	0.01724	0.02153	0.51363	0.38938	0.24952
V36	-0.05584	-0.07040	-0.06620	-0.17090	-0.03195	-0.04215	-0.09534	-0.07583	-0.07107	-0.06436
V37	0.33303	0.34281	0.21382	0.18111	-0.00997	0.03087	0.01435	0.50005	0.35058	0.17596
V38	-0.14039	-0.19440	-0.11476	-0.09296	0.13338	-0.01727	0.05874	-0.36474	-0.27274	-0.11123
V39	-0.03129	-0.27806	-0.21834	-0.18415	-0.07272	-0.03725	-0.16501	-0.24377	-0.21963	-0.07394
V40	0.29563	0.31261	0.18314	0.13512	-0.04154	0.02021	-0.00732	0.45182	0.31610	0.14247
V41	-0.13173	-0.12525	-0.05918	-0.00685	0.14434	0.06023	0.12680	-0.23630	-0.16052	-0.07066
V42	0.17365	0.23145	0.02636	0.04882	0.09663	0.04789	0.02245	0.24088	0.13121	0.03885
V43	0.00860	0.07612	0.06861	0.01150	0.01140	-0.00462	0.01200	0.10401	0.06039	0.01835
V52	0.02777	0.04213	-0.01660	0.00586	-0.01024	0.00069	0.00002	0.10206	0.05955	0.04580
V53	0.20517	0.19891	0.13078	0.09681	0.08111	0.02549	0.06685	0.14784	0.12312	0.08166
V54	0.12916	0.03931	0.03684	0.09479	0.00470	0.02749	0.04516	0.05873	0.04528	0.05464
V55	0.06547	0.08994	0.04557	0.07355	0.06355	0.06138	0.01420	0.09194	0.07529	0.00777
V56	0.03271	0.00294	0.02266	0.00101	0.02259	0.03633	0.02080	0.01847	0.03981	-0.00210
V57	0.57681	0.18118	0.20958	0.30087	0.25354	0.16300	0.21775	0.10096	0.14177	0.16498
V58	-0.32797	-0.16580	-0.11404	-0.09173	-0.18151	-0.06809	-0.05063	-0.22282	-0.10293	-0.02986
V59	0.43594	0.41120	0.30247	0.35189	0.19264	0.15563	0.27803	0.34844	0.30419	0.25614
V60	-0.17308	-0.08528	-0.09625	-0.05200	-0.04219	-0.01355	-0.05543	-0.08800	-0.09152	-0.07598
OVASS	0.50726	0.29865	0.20317	0.25617	0.18261	0.09854	0.24631	0.16898	0.16483	0.16422
SEX	-0.07658	-0.06544	-0.03886	-0.05153	-0.08290	-0.09244	-0.04455	-0.11614	-0.07687	-0.04728
AGE	0.10096	0.19988	0.19530	0.03346	0.08971	0.14694	0.11588	0.17444	0.18868	-0.01044

	V24	V25	V26	V27	V30	V34	V35	V36	V37	V38
V1	0.05922	0.18981	0.10862	0.16944	0.09353	0.15468	0.30172	-0.05584	0.33303	-0.14039
V3	-0.10044	0.26829	0.09915	0.04725	0.32518	0.09959	0.38313	-0.07040	0.34281	-0.19440
V4	-0.06298	0.10751	0.20841	0.05945	0.11072	0.07795	0.26448	-0.06620	0.21382	-0.11476
V5	0.04559	0.10685	0.09752	0.39777	0.03088	0.13341	0.25324	-0.17090	0.18111	-0.09296
V16	-0.08219	0.14757	0.11586	-0.06246	0.05329	0.27454	-0.03692	-0.03195	-0.00997	0.13338
V17	-0.04884	0.03624	0.19551	-0.02520	-0.00529	0.14376	0.01724	-0.04215	0.03087	-0.01727
V18	0.04817	0.07932	0.09400	0.07001	0.04998	0.24267	0.02153	-0.09534	0.01435	0.05874
V20	-0.09392	0.15432	-0.01298	0.10172	0.18343	-0.09026	0.51363	-0.07583	0.50005	-0.36474
V21	-0.08116	0.14811	0.25095	0.10780	0.13722	-0.03041	0.38938	-0.07107	0.35058	-0.27274
V22	0.09622	0.01858	0.00981	0.38520	0.06646	-0.05994	0.24952	-0.06436	0.17596	-0.11123
V24	0.20650	-0.06355	0.02209	0.12974	-0.12325	-0.03449	-0.03538	-0.07974	0.00215	0.02272
V25	-0.06355	0.57386	0.13863	0.00473	0.41459	0.24043	0.14748	-0.08315	0.09281	0.00377
V26	0.02209	0.13863	0.31440	0.02326	0.04545	0.10256	0.02602	-0.08941	-0.03233	0.06235
V27	0.12974	0.00473	0.02326	0.37266	-0.00444	0.00023	0.17735	-0.14712	0.14276	-0.08839
V30	-0.12325	0.41459	0.04545	-0.00444	0.59988	0.15615	0.20815	-0.01407	0.17752	-0.08085
V34	-0.03449	0.24043	0.10256	0.00023	0.15615	0.62591	-0.18706	-0.09902	-0.27606	0.43196
V35	-0.03538	0.14748	0.02602	0.17735	0.20815	-0.18706	0.73120	-0.08891	0.68679	-0.53403
V36	-0.07974	-0.08315	-0.08941	-0.14712	-0.01407	-0.09902	-0.08891	0.42548	0.01351	-0.06963
V37	0.00215	0.09281	-0.03233	0.14276	0.17752	-0.27606	0.68679	0.01351	0.94270	-0.76108
V38	0.02272	0.00377	0.06235	-0.08839	-0.08085	0.43196	-0.53403	-0.06963	-0.76108	0.93837
V39	0.03462	-0.20108	-0.07109	-0.08910	-0.26228	-0.18562	-0.24008	0.15161	-0.21760	0.07345
V40	0.00367	0.12969	0.04447	0.14188	0.17554	-0.24776	0.65611	-0.02870	0.85128	-0.74285
V41	-0.01181	0.03921	0.06735	-0.04928	-0.00341	0.48576	-0.43528	-0.12897	-0.70035	0.82612
V42	-0.12254	0.17520	0.00950	-0.00687	0.22331	0.03396	0.21942	0.04767	0.24967	-0.22473
V43	-0.05332	0.03285	-0.02493	-0.00474	0.10350	-0.02343	0.08792	0.02583	0.10090	-0.08729
V52	-0.02048	0.00755	-0.02833	0.00297	0.06503	-0.03542	0.06450	0.02374	0.11814	-0.08196
V53	-0.04728	0.23719	0.05737	0.04363	0.23403	0.10225	0.18252	-0.04028	0.16028	-0.12129
V54	0.08174	-0.01054	0.03231	0.10079	-0.03117	-0.04803	0.11670	-0.08924	0.16590	-0.09024
V55	-0.02400	0.12657	0.06605	0.03712	0.10220	0.08954	0.05951	-0.03214	0.03323	-0.00659
V56	0.00092	-0.00408	0.02406	-0.00738	-0.01394	0.02426	-0.00785	0.03054	-0.02860	0.00326
V57	0.11733	0.10564	0.13440	0.14499	0.00139	0.16753	0.11291	-0.08901	0.09911	-0.00079
V58	-0.01447	-0.12563	-0.05851	-0.06904	-0.13567	-0.24009	-0.22798	0.12996	-0.20124	-0.18388
V59	-0.01046	0.26881	0.08433	0.18059	0.29752	0.20853	0.38734	-0.15225	0.33597	-0.10862
V60	-0.00821	-0.03835	-0.03683	-0.07251	-0.08104	-0.08662	-0.15710	0.02750	-0.14144	-0.02162
OVASS	0.07763	0.26157	0.11984	0.15423	0.17639	0.23983	0.20788	-0.12880	0.16743	-0.02397
SEX	0.05236	0.04468	0.00487	0.00922	-0.00466	0.01545	-0.05949	0.02967	-0.06689	0.05251
AGE	-0.10480	0.08028	0.02253	-0.02454	0.11614	0.05192	0.21972	-0.07703	0.22851	-0.18044

	V39	V40	V41	V42	V43	V52	V53	V54	V55	V56
V1	-0.03129	0.29563	-0.13173	0.17365	0.00860	0.02777	0.20517	0.12916	0.06547	0.03271
V3	-0.27806	0.31261	-0.12525	0.23145	0.07612	0.04213	0.19891	0.03931	0.08994	0.00294
V4	-0.21834	0.18314	-0.05918	0.02636	0.06861	-0.01660	0.13078	0.03684	0.04557	0.02266
V5	-0.18415	0.13512	-0.00685	0.04882	0.01150	0.00586	0.09681	0.09479	0.07355	0.00101
V16	-0.07272	-0.04154	0.14434	0.09663	0.01140	-0.01024	0.08111	0.00470	0.06355	0.02259
V17	-0.03725	0.02021	0.06023	0.04789	-0.00462	0.00069	0.02549	0.02749	0.06138	0.03633
V18	-0.16501	-0.00732	0.12680	0.02245	0.01200	0.00002	0.06685	0.04516	0.01420	0.02080
V20	-0.24377	0.45182	-0.23630	0.24088	0.10401	0.10206	0.14784	0.05873	0.09194	0.01847
V21	-0.21963	0.31610	-0.16052	0.13121	0.06039	0.05955	0.12312	0.04528	0.07529	0.03981
V22	-0.07394	0.14247	-0.07066	0.03885	0.01835	0.04580	0.08166	0.05464	0.00777	-0.00210
V24	0.03462	0.00367	-0.01181	-0.12254	-0.05332	-0.02048	-0.04728	0.08174	-0.02400	0.00092
V25	-0.20108	0.12969	0.03921	0.17520	0.03285	0.00755	0.23719	-0.01054	0.12657	-0.00408
V26	-0.07109	0.04447	0.06735	0.00950	-0.02493	-0.02833	0.05737	0.03231	0.06605	0.02406
V27	-0.08910	0.14188	-0.04928	-0.00687	-0.00474	0.00297	0.04363	0.10079	0.03712	-0.00738
V30	-0.26228	0.17554	-0.00341	0.22331	0.10350	0.06503	0.23403	-0.03117	0.10220	-0.01394
V34	-0.18562	-0.24776	0.48576	0.03396	-0.02343	-0.03542	0.10225	-0.04803	0.08954	0.02426
V35	-0.24008	0.65611	-0.43528	0.21942	0.08792	0.06450	0.18252	0.11670	0.05951	-0.00785
V36	0.15161	-0.02870	-0.12897	0.04767	0.02583	0.02374	-0.04028	-0.08924	-0.03214	0.03054
V37	-0.21760	0.85128	-0.70035	0.24967	0.10090	0.11814	0.16028	0.16590	0.03323	-0.02860
V38	0.07345	-0.74285	0.82612	-0.22473	-0.08729	-0.08196	-0.12129	-0.09024	-0.00659	0.00326
V39	0.67584	-0.16981	0.00704	-0.12690	-0.08057	-0.04122	-0.17584	0.01871	-0.11343	0.00617
V40	-0.16981	0.93898	-0.70944	0.29642	0.09243	0.09339	0.17084	0.15802	0.04229	-0.02778
V41	0.00704	-0.70944	0.93436	-0.16846	-0.05918	-0.05577	-0.10818	-0.09531	0.02927	0.04431
V42	-0.12690	0.29642	-0.16846	0.33819	0.10806	0.06016	0.14685	0.00577	0.09675	0.00509
V43	-0.08057	0.09243	-0.05918	0.10806	0.10601	0.01897	0.06855	-0.01671	0.04571	-0.00259
V52	-0.04122	0.09339	-0.05577	0.06016	0.01897	0.12739	0.01803	0.00881	-0.00353	0.01436
V53	-0.17584	0.17084	-0.10818	0.14685	0.06855	0.01803	0.26292	-0.00709	0.10327	-0.01958
V54	0.01871	0.15802	-0.09531	0.00577	-0.01671	0.00881	-0.00709	0.20653	0.00526	-0.03394
V55	-0.11343	0.04229	0.02927	0.09675	0.04571	-0.00353	0.10327	0.00526	0.15641	0.01506
V56	0.00617	-0.02778	0.04431	0.00509	-0.00259	0.01436	-0.01958	-0.03394	0.01506	0.06871
V57	0.08855	0.08788	0.01252	0.09098	-0.02174	0.00857	0.10660	0.12012	0.08048	0.04067
V58	0.06018	-0.18479	-0.19908	-0.04083	-0.01070	-0.06990	-0.09328	-0.03073	-0.05498	-0.03439
V59	-0.26440	0.29710	0.00294	0.18698	0.08555	0.04517	0.19808	0.04220	0.11360	0.02001
V60	0.04453	-0.15047	-0.04895	-0.04740	-0.04300	-0.02399	-0.07561	-0.01126	-0.05515	-0.01700
OVASS	-0.16225	0.18194	-0.02146	0.13948	0.01036	0.00409	0.21309	0.08674	0.08556	0.00157
SEX	0.01853	-0.04229	-0.00354	-0.06308	-0.00896	-0.05020	-0.01378	-0.03069	-0.02422	-0.01236
AGE	-0.12451	0.21642	-0.08713	0.10716	0.06239	0.00500	0.07997	-0.02018	0.04543	0.02344

	V57	V58	V59	V60	OVASS	SEX	AGE
V1	0.57681	-0.32797	0.43594	-0.17308	0.50726	-0.07658	0.10096
V3	0.18118	-0.16580	0.41120	-0.08528	0.29865	-0.06544	0.19988
V4	0.20958	-0.11404	0.30247	-0.09625	0.20317	-0.03886	0.19530
V5	0.30087	-0.09173	0.35189	-0.05200	0.25617	-0.05153	0.03346
V16	0.25354	-0.18151	0.19264	-0.04219	0.18261	-0.08290	0.08971
V17	0.16300	-0.06809	0.15563	-0.01355	0.09854	-0.09244	0.14694
V18	0.21775	-0.05063	0.27803	-0.05543	0.24631	-0.04455	0.11588
V20	0.10096	-0.22282	0.34844	-0.08800	0.16898	-0.11614	0.17444
V21	0.14177	-0.10293	0.30419	-0.09152	0.16483	-0.07687	0.18868
V22	0.16498	-0.02986	0.25614	-0.07598	0.16422	-0.04728	-0.01044
V24	0.11733	-0.01447	-0.01046	-0.00821	0.07763	0.05236	-0.10480
V25	0.10564	-0.12563	0.26881	-0.03835	0.26157	0.04468	0.08028
V26	0.13440	-0.05851	0.08433	-0.03683	0.11984	0.00487	0.02253
V27	0.14499	-0.06904	0.18059	-0.07251	0.15423	0.00922	-0.02454
V30	0.00139	-0.13567	0.29752	-0.08104	0.17639	-0.00466	0.11614
V34	0.16753	-0.24009	0.20853	-0.08662	0.23983	0.01545	0.05192
V35	0.11291	-0.22798	0.38734	-0.15710	0.20788	-0.05949	0.21972
V36	-0.08901	0.12996	-0.15225	0.02750	-0.12880	0.02967	-0.07703
V37	0.09911	-0.20124	0.33597	-0.14144	0.16743	-0.06689	0.22851
V38	-0.00079	-0.18388	-0.10862	-0.02162	-0.02397	0.05251	-0.18044
V39	0.08855	0.06018	-0.26440	0.04453	-0.16225	0.01853	-0.12451
V40	0.08788	-0.18479	0.29710	-0.15047	0.18194	-0.04229	0.21642
V41	0.01252	-0.19908	0.00294	-0.04895	-0.02146	-0.00354	-0.08713
V42	0.09098	-0.04083	0.18698	-0.04740	0.13948	-0.06308	0.10716
V43	-0.02174	-0.01070	0.08555	-0.04300	0.01036	-0.00896	0.06239
V52	0.00857	-0.06990	0.04517	-0.02399	0.00409	-0.05020	0.00500
V53	0.10660	-0.09328	0.19808	-0.07561	0.21309	-0.01378	0.07997
V54	0.12012	-0.03073	0.04220	-0.01126	0.08674	-0.03069	-0.02018
V55	0.08048	-0.05498	0.11360	-0.05515	0.08556	-0.02422	0.04543
V56	0.04067	-0.03439	0.02001	-0.01700	0.00157	-0.01236	0.02344
V57	0.70574	-0.17678	0.32114	-0.11104	0.44215	-0.08395	-0.00765
V58	-0.17678	0.78861	-0.33268	0.29017	-0.18316	0.03737	-0.11311
V59	0.32114	-0.33268	0.62782	-0.15216	0.36899	-0.05653	0.20713
V60	-0.11104	0.29017	-0.15216	0.33475	-0.10981	0.02235	-0.09264
OVASS	0.44215	-0.18316	0.36899	-0.10981	0.48980	-0.01658	0.04913
SEX	-0.08395	0.03737	-0.05653	0.02235	-0.01658	0.17027	-0.07147
AGE	-0.00765	-0.11311	0.20713	-0.09264	0.04913	-0.07147	0.31441

FACTOR MATRIX USING IMAGE FACTOR

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5	FACTOR 6	FACTOR 7	FACTOR 8	FACTOR 9	FACTOR 10
V1	0.30187	0.56903	0.26075	-0.39280	0.18964	0.02048	0.12327	0.01221	-0.06214	-0.03983
V3	0.31933	0.42806	0.04685	0.20290	0.19271	0.01996	0.08737	0.03998	0.01100	-0.16205
V4	0.20345	0.39570	0.23372	0.18757	0.13271	-0.42800	-0.12171	0.30066	0.02378	0.08675
V5	0.16545	0.46704	0.49547	0.09745	-0.34814	0.09109	-0.11483	-0.10184	0.16415	-0.01559
V16	-0.06547	0.36144	0.10279	-0.06630	0.27672	-0.16383	-0.05349	-0.14667	0.11028	-0.05461
V17	0.02216	0.23554	0.17952	0.03967	0.17077	-0.31588	-0.06833	-0.06012	0.08954	0.01113
V18	-0.01933	0.38420	0.32211	0.10551	0.08249	-0.09808	-0.25597	-0.34123	0.14772	-0.10471
V20	0.47598	0.32156	-0.07260	0.15260	-0.08574	-0.04121	0.21796	0.01186	-0.08574	-0.22552
V21	0.35185	0.34376	0.17232	0.24729	0.00346	-0.30753	0.03005	0.27520	0.01004	0.04068
V22	0.17619	0.25771	0.33246	0.04748	-0.47063	0.23020	0.09092	0.21947	0.07500	0.01912
V24	-0.00607	0.00430	0.08636	-0.19494	-0.15082	0.09657	-0.12713	-0.04386	-0.15668	0.18071
V25	0.08209	0.34956	-0.05197	0.21706	0.34663	0.33839	0.06236	0.11904	0.11901	0.15763
V26	-0.01447	0.20996	0.09603	0.04556	0.14116	-0.11358	-0.20882	0.23098	-0.02032	0.13608
V27	0.14225	0.21887	0.23572	-0.01953	-0.39052	0.20689	-0.07006	0.04472	-0.02145	0.10754
V30	0.15374	0.29577	-0.16424	0.34953	0.27368	0.31401	0.20848	0.09725	0.17441	0.10159
V34	-0.36865	0.49028	-0.03338	0.07471	0.23362	0.11657	-0.13716	-0.19808	0.04887	0.10928
V35	0.68728	0.30363	-0.07268	0.12002	-0.15341	-0.01729	0.12310	0.13565	-0.09033	-0.13468
V36	0.02732	-0.24524	-0.02120	-0.07825	0.12604	-0.05128	0.16062	0.00919	0.23953	-0.03574
V37	0.92424	0.15855	-0.12485	-0.00778	-0.07497	-0.05939	0.05622	-0.09207	-0.01484	0.07084
V38	-0.89272	0.25162	-0.14579	-0.09242	-0.02918	0.04304	-0.11406	0.08277	-0.00222	-0.04129
V39	-0.16559	-0.31593	0.06306	-0.54665	-0.03503	-0.08846	0.18064	0.09201	0.25305	0.02123
V40	0.91266	0.12455	-0.17121	-0.04714	0.00646	0.06340	-0.16647	0.04469	-0.01508	-0.02547
V41	-0.84832	0.36898	-0.12022	0.10374	-0.08636	-0.05664	0.08079	-0.07225	-0.05915	0.04377
V42	0.27756	0.14724	-0.04402	0.08982	0.20323	0.15696	0.10515	-0.02752	0.01482	-0.19744
V43	0.10189	0.04069	-0.03493	0.11140	0.03670	-0.00090	0.05821	0.01132	0.03177	-0.07367
V52	0.10173	0.03746	-0.06250	0.01251	-0.03402	0.00633	0.08583	-0.03988	0.02710	-0.01075
V53	0.17756	0.21511	0.03793	0.09695	0.19414	0.17171	0.04816	0.07832	0.04091	-0.00680
V54	0.14806	0.07939	0.04459	-0.12690	-0.07933	0.00461	-0.08467	-0.03454	-0.13221	0.09461
V55	0.02959	0.14673	0.00736	0.08303	0.08433	0.06607	0.03214	0.01251	-0.03476	0.00266
V56	-0.02471	0.03639	0.02366	-0.00778	0.02003	-0.06855	0.06084	-0.00792	0.00952	-0.00854
V57	0.08782	0.46155	0.40486	-0.44308	0.17089	0.02880	0.09752	-0.00340	-0.16633	0.05188
V58	-0.04964	-0.60828	0.46848	0.29159	0.11311	0.09287	-0.03505	-0.00760	-0.16312	-0.00214
V59	0.27013	0.63835	0.07561	0.09011	0.03058	0.06490	0.10372	-0.02900	0.02249	-0.08139
V60	-0.08590	-0.27998	0.16797	0.10985	0.06147	0.03474	0.00578	-0.04537	-0.03131	-0.03977
OVASS	0.15371	0.49388	0.22548	-0.14517	0.21779	0.20797	-0.02245	0.01454	-0.15324	-0.00260
SEX	-0.05511	-0.08357	-0.04081	-0.00009	0.01622	0.10871	-0.10177	0.06591	0.04079	0.12014
AGE	0.21697	0.17515	-0.07429	0.16335	0.10865	-0.19324	0.01993	-0.05927	0.06307	-0.08196

	FACTOR 11	FACTOR 12	FACTOR 13	FACTOR 14	FACTOR 15	FACTOR 16	FACTOR 17	FACTOR 18	FACTOR 19	FACTOR 20
V1	-0.06306	-0.01302	-0.02858	-0.00307	-0.03643	0.00533	0.01715	-0.00143	0.00966	-0.01087
V3	0.09250	0.00908	-0.00652	-0.01180	-0.00887	-0.02839	-0.09053	0.02622	-0.00801	0.03697
V4	-0.02326	0.02127	0.00601	0.01366	0.00999	0.00773	-0.00631	-0.00556	0.00478	-0.00734
V5	0.02594	-0.03161	-0.00748	-0.01618	-0.01024	0.00334	0.01403	-0.00535	0.00010	0.00135
V16	-0.03217	0.08865	-0.05192	0.01946	-0.07178	-0.07680	-0.04645	0.04016	0.01124	0.02609
V17	-0.03398	0.09303	-0.01369	0.09595	-0.03470	0.04771	-0.01446	-0.09867	0.03273	0.02134
V18	0.14232	-0.12431	-0.01212	0.00465	0.02442	-0.00072	0.00830	0.00482	-0.00301	-0.01571
V20	0.00901	-0.01064	0.02898	-0.01845	0.05773	0.06153	-0.04911	-0.00139	0.03405	0.00110
V21	-0.02026	-0.03855	0.01817	-0.07931	0.08027	-0.00289	0.01902	0.00927	-0.04302	-0.01036
V22	-0.13568	0.08376	-0.02367	0.01136	-0.02073	-0.02273	-0.01981	-0.00121	0.00435	0.00549
V24	0.07516	-0.06552	0.08947	0.04562	-0.01289	0.01468	0.00854	-0.00143	-0.01105	0.01946
V25	0.17525	-0.02414	0.00542	-0.01831	-0.03145	0.02368	-0.00079	-0.01786	-0.01905	0.00844
V26	0.03342	-0.07585	0.02548	0.07849	-0.05489	-0.06287	-0.00152	0.05542	0.05301	-0.00022
V27	-0.06054	0.02287	-0.02516	0.04294	0.00600	0.02213	-0.00542	0.01821	0.00092	0.00266
V30	0.05996	-0.01636	-0.04279	-0.01403	-0.02959	0.01769	0.00793	-0.00421	0.01404	-0.01260
V34	-0.19492	0.07901	0.00322	-0.02074	0.06035	0.02247	-0.02248	0.01321	0.00573	-0.00494
V35	0.11813	-0.09499	-0.02119	0.04147	-0.03405	-0.00379	0.02149	-0.00506	0.01021	-0.00087
V36	-0.25702	-0.20125	0.14126	0.05550	-0.05244	0.06109	0.02013	0.00046	-0.01991	0.02016
V37	0.02374	0.01737	-0.01231	0.00103	0.00602	-0.00990	0.00211	0.00102	0.00286	-0.00344
V38	0.03060	0.01927	-0.01005	-0.00415	0.00270	0.00617	0.00693	-0.00077	0.00299	-0.00243
V39	0.15278	0.05160	-0.02695	0.00403	0.05703	-0.00217	-0.00944	0.01171	0.00880	-0.00624
V40	-0.02288	0.00163	0.01265	-0.00710	-0.00740	0.00512	0.00292	-0.00160	-0.00102	0.00143
V41	-0.00816	-0.01753	0.00465	0.00412	-0.00707	-0.00971	0.00408	-0.00088	-0.00042	0.00128
V42	-0.15864	0.02181	-0.05438	0.05848	0.04907	-0.11641	0.02749	-0.01418	-0.01428	-0.03636
V43	-0.06152	0.00214	-0.03027	0.05960	0.11552	-0.04483	0.04779	-0.00829	-0.02249	0.07688
V52	-0.05965	-0.02955	0.02384	-0.12598	0.08815	0.07996	0.07991	0.01275	0.09437	0.02513
V53	-0.06389	-0.03970	-0.11830	0.10762	0.09551	-0.03454	0.08524	0.03073	0.00103	0.01290
V54	0.14894	0.02400	-0.09963	0.12757	0.05748	0.10908	-0.01379	0.04017	-0.03388	0.03279
V55	-0.06937	-0.01418	-0.04805	0.18833	0.05319	0.09758	-0.03863	0.01354	0.02315	-0.04974
V56	-0.07515	-0.06679	0.07295	-0.03292	-0.06199	0.04524	0.00386	0.10487	0.01273	-0.00493
V57	0.00754	-0.02026	0.02103	-0.02586	-0.01387	-0.00415	0.01327	-0.00864	-0.00436	0.00565
V58	0.02434	0.03318	-0.03017	-0.01627	-0.00203	0.00829	0.00239	0.00320	0.01416	-0.00227
V59	0.05320	0.15280	0.18031	0.01338	0.01790	0.01897	-0.00715	0.01153	-0.00804	-0.00395
V60	0.12791	0.17367	0.24507	0.08457	-0.00770	-0.02177	0.08501	0.01063	-0.00900	-0.00901
OVASS	0.01453	-0.05035	-0.00268	-0.01955	0.06726	-0.00362	-0.01165	-0.01246	-0.01044	0.00935
SEX	0.05586	-0.08964	0.14428	0.01368	0.07847	-0.10662	-0.01321	-0.01947	0.08199	0.01791
AGE	0.00416	0.18769	-0.14203	-0.03654	-0.08442	0.04257	0.09775	0.01824	0.00832	0.01997

	FACTOR 21	FACTOR 22
V1	-0.00255	0.00003
V3	-0.00533	0.00010
V4	-0.00682	0.00001
V5	-0.00766	-0.00004
V16	0.04028	-0.00000
V17	0.01601	-0.00005
V18	0.00299	0.00003
V20	-0.00190	0.00007
V21	0.02144	0.00002
V22	0.00136	-0.00006
V24	0.01003	0.00025
V25	-0.00679	0.00001
V26	-0.05488	0.00002
V27	0.01815	0.00021
V30	0.01024	0.00000
V34	-0.00797	0.00007
V35	0.00445	0.00002
V36	-0.00187	0.00002
V37	-0.00149	-0.00000
V38	0.00185	0.00000
V39	-0.00119	0.00003
V40	0.00369	-0.00000
V41	0.00112	-0.00001
V42	-0.01591	0.00004
V43	-0.02775	0.00000
V52	-0.00887	0.00005
V53	0.03034	0.00003
V54	-0.00212	-0.00012
V55	0.00878	-0.00005
V56	0.02425	-0.00021
V57	0.00561	0.00002
V58	0.00393	0.00001
V59	-0.00572	-0.00001
V60	0.00562	0.00000
OVASS	-0.00943	-0.00021
SEX	0.03578	-0.00010
AGE	-0.00548	-0.00001

VARIABLE	COMMUNALITY
V1	0.70122
V3	0.42177
V4	0.60345
V5	0.68313
V16	0.32204
V17	0.26955
V18	0.53086
V20	0.48550
V21	0.52363
V22	0.57465
V24	0.17396
V25	0.50449
V26	0.23385
V27	0.34621
V30	0.53504
V34	0.57315
V35	0.69484
V36	0.30780
V37	0.92222
V38	0.91586
V39	0.57502
V40	0.91549
V41	0.90941
V42	0.27639
V43	0.07012
V52	0.07802
V53	0.21684
V54	0.15562
V55	0.10314
V56	0.04577
V57	0.65300
V58	0.72946
V59	0.57801
V60	0.25749
OVASS	0.46259
SEX	0.11313
AGE	0.24978

FACTOR	EIGENVALUE	PCT OF VAR	CUM PCT
1	58.99694	46.1	46.1
2	16.49914	12.9	59.1
3	7.36359	5.8	64.8
4	5.97001	4.7	69.5
5	5.07860	4.0	73.5
6	4.16466	3.3	76.7
7	3.62172	2.8	79.5
8	3.46065	2.7	82.3
9	2.72304	2.1	84.4
10	2.36673	1.9	86.2
11	2.31910	1.8	88.1
12	1.93275	1.5	89.6
13	1.80577	1.4	91.0
14	1.53748	1.2	92.2
15	1.49218	1.2	93.3
16	1.41970	1.1	94.5
17	1.33228	1.0	95.5
18	1.23322	1.0	96.5
19	1.22066	1.0	97.4
20	1.16583	0.9	98.3
21	1.13491	0.9	99.2
22	1.00064	0.8	100.0

DOLLRIER FREEZING WORKS (N.Z.) LTD. FACT SHEET

The Dollrier Freezing Works (N.Z.) Ltd. is a large meat freezing company based in the South Island. The company employs nearly 700 people at peak times of the killing season. The company is rather worse than usual for the industry and has the worst strike record of all the freezing works in New Zealand. Industrial relations are extremely sensitive not improved by a personal antagonism which exists between the production manager and the local secretary of the meat workers union.

Productivity at the works has been poor and the parent company Dasport Ltd. based in Britain have threatened to shut the works down. The management at the works is extremely formal in structure and "Communication through the right channels" a necessity if the rancour of other managers is to be avoided. Communication on an informal basis between foremen does not occur but due to the climate of mistrust which exists in the organisation there's a tendency to communicate in writing and keep a copy. Labour for the kill is comparatively easy to get compared to other works in the country and there is no shortage of applicants for jobs. The works itself is one of the most modern in the country, it only having been built four years ago.

For the future the directors of the company hope that managers will improve their relations with other managers and the rest of the staff and have declared themselves open to suggestions as to how this may be achieved.

For the purposes of this exercise you are A.J. Doyle. You have just returned from hospital after surgery after four weeks away from work. Today's date is July 8th and a calendar for the month is shown below:

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

You are a foreman in theworks and a brief job description (available on a separate sheet) lists your duties.

The items provided separately are found in your in-basket on your arrival at work. State exactly what you will do in the place provided after each item.

JOB DESCRIPTION

DOLLRIER FREEZING WORKS (N.Z.) LTD.

JOB TITLE FOREMAN

Section Under the general supervision of the production manager, the foreman of each section is responsible directly for quantity and quality of production in the section, supervision and control of staff, and the day to day running of the section.

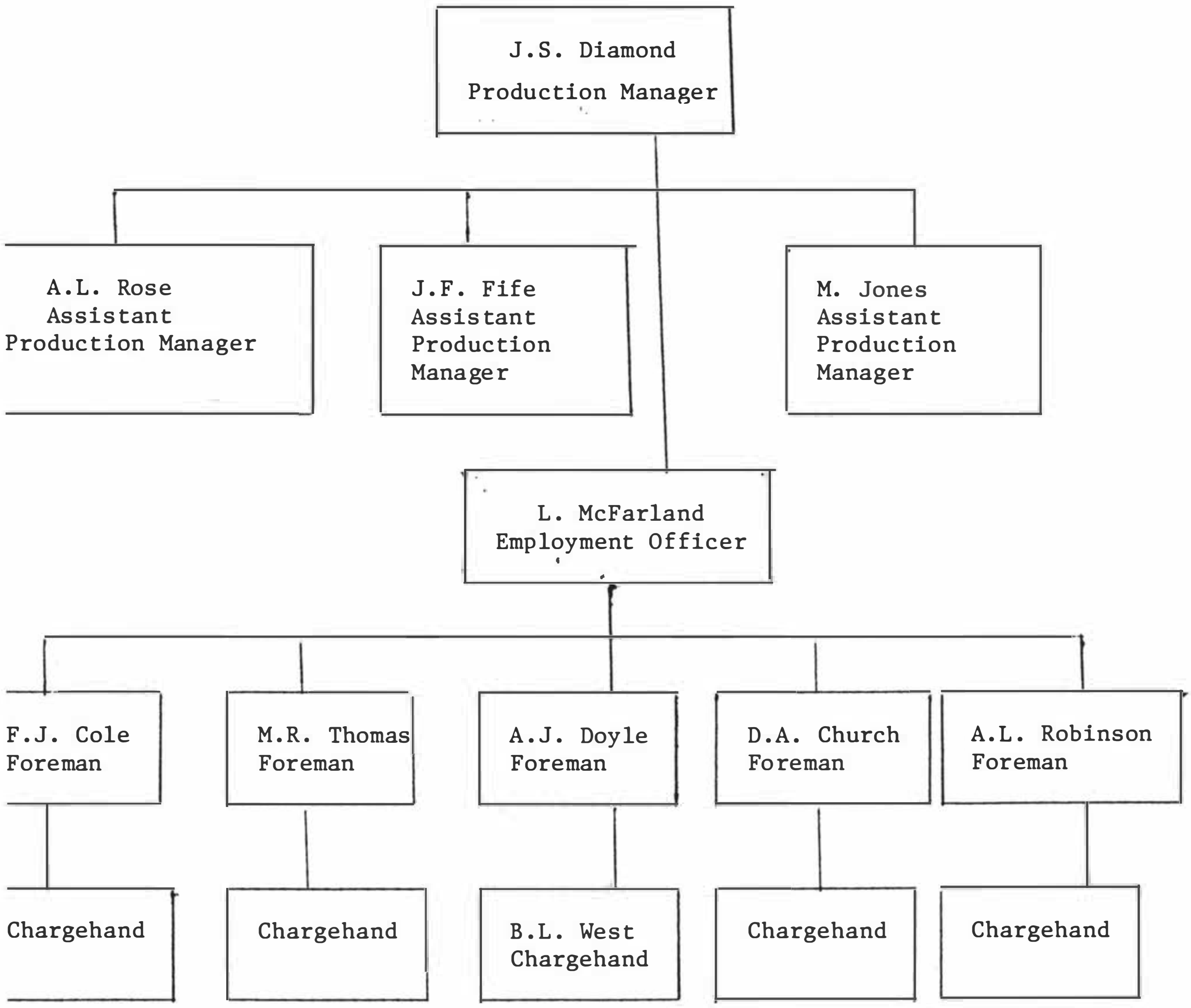
The foreman has to deal with outside bodies such as Government Hygiene Control and has to ensure that the section is complying with such regulations that exist. Work is subject to review by the production manager or his assigned deputy through meetings, reports and operating results achieved.

Regular Duties

1. Directs and controls the operations within a section.

2. Monitors the work of others directly under him.

COMPANY ORGANISATION CHART



ITEM 3 MEMO

Dollrier Freezing Works (N.Z.) Ltd.

From J.S. Diamond July 2nd

To A. Doyle

Could you please prepare your suggestions for items 2 and 4.

Action What I will do.

....

ITEM 1 MEMO

Dollrier Freezing Works (N.Z.) Ltd.

July 2nd

To Alan

From Fred Cole

There seems to be a bit of trouble with my men about safety in my section. Are you having any problems? I could do with some help or advice.

Action What I will do.

ITEM 4

Dr. J.S. Wardlow,
15/16 Egmont St.
Dollrier.

July 1st

Dear Mr Doyle,

Mr. J.S. Beddows of the men in your section has asked me to write to you to inform you that he is suffering from pneumonia and will be unable to come to work for at least three more weeks.

Dr. J.S. Wardlow

Action What I will do.

....

ITEM 2 MEMO

Dollrier Freezing Works (N.Z.) Ltd.

From J.S. Diamond July 2nd

To All Production Staff

There will be a staff meeting on July 14th in the conference room at 2 p.m.

Agenda

1. Minutes of last meeting.
2. Accident Prevention.
3. Equal Pay Act.
4. Strike Early Warning System.
5. Any other business.

Action What I will do.

ITEM 5 MEMO

Dollrier Freezing Works (N.Z.) Ltd.

From L. McFarland

To All Foremen

From 21st July there will be a fire bell check which will last for 20 seconds at 11.00 a.m. each Monday.

Action What I will do.

....

ITEM 6 MEMO

Dollrier Freezing Works (N.Z.) Ltd.

From F.J. Cole July 5th

To A. Doyle

Could I talk to you sometime about the agenda for the next staff meeting?

Action What I will do.

ITEM 7

While you were Out

Date: July 7th

A Mr. Brown telephoned.

Signed Brian West

Action What I will do.

....

ITEM 8 MEMO

Dollrier Freezing Works (N.Z.) Ltd.

To A.J. Doyle

From B. West

Subject Holidays

Instead of taking a week in October as I originally requested, can I now have a week's holiday between the 27th and 31st July?

Action What I will do.

ITEM 9

Elkart Butchery,
Fiston,
Near Trafalgar

July 2nd

Dear Sir,

A quantity of lamb from your works which arrived in your depot on June 24th was after inspection observed to be freezer burnt. We would appreciate your comments with a view to reimbursement for the damaged lamb.

A. Blaxton
Managing Director

Mr. Doyle Please deal with the above.

J.S. Diamond.

Action What I will do.

....

ITEM 10 MEMO

Dollrier Freezing Works (N.Z.) Ltd.

From M. Jones July 1st

To A.J.Doyle

A group of technical institute students will be visiting the works on July 18th. You have been allocated ½ hour from 9.00 a.m. to discuss the work of your section with them.

Action What I will do.

ITEM 11

Government Hygiene Control
WELLINGTON

Dear Mr Doyle,

Following the inspection of your section we were somewhat disappointed that unlike other foremen at the works you seemed only to be complying with the minimum standards as laid down by the act. In our assessment it would take little for you to break those regulations especially in view of the attitudes we noticed displayed by some of the people in your section. We trust that for our next visit here there will be some improvement.

Yours sincerely,

M. Banks (Ms)

Action What I will do.

....

ITEM 12

Sent from Mr. Diamond's Office

Meat Union,
Dollrier.

Dear Mr. Diamond,

We have taken exception to the attitude of one of your foremen, Mr. Doyle in our dealings with him. We consider him to be particularly unco-operative as far as the problems of one of our members (Mr. Meecham) is concerned. Mr. Meecham was away for four weeks and found on his return that he had been moved from his old job. Repeated requests for a movement back to his former job failed to produce the required response. We therefore approach you and formally request a meeting to discuss the matter as soon as possible.

Yours sincerely,

J. James
Secretary

Action What I will do.

ITEM 13 MEMO

Dollrier Freezing Works (N.Z.) Ltd.

To All Foremen. July 1st

From A.L. Rose

A noticeable slackness is emerging in the filling of weekly production figures especially in arithmetic calculations. Tighten up on this aspect of your work.

Action What I will do.

....

ITEM 14 MEMO

Dollrier Freezing Works (N.Z.) Ltd.

From L. McFarland

To A.J. Doyle

Can you provide me with a complete record of people who have consistently been late starting work whether in the morning or after breaks, for your section?

Action What I will do:

ITEM 15 MEMO

Dollrier Freezing Works (N.Z.) Ltd.

From D.A. Church CONFIDENTIAL

To A.J. Doyle

I'd like your advice on what to do with Mr. Simpkins my chargehand who really can't cope with the job.

Action What I will do