Structure and Activity of Task - Directed Groups.

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A Thesis for the degree of Doctor of Philosophy

Faculty of Engineering

University of London

~~1973~~
1975

ABSTRACT

This thesis proposes a simple model of group functioning which is relevant for the theory of complex organisations. Research has been carried out in groups in both organisational and non-organisational settings using the group functioning model .

The first section of the thesis discusses the basic requirements for group research to be relevant for organisation theory and identifies the need for group research using concepts more normally associated with total organisation studies . The simple model of group functioning , with the contained concepts of Membership , Structure , and Activity , is formulated . The particular relationships of Group Tasks and Group Performance with these concepts are indicated . The similarity of the Group Structure concept , with operationable variables , to other research in task-directed groups is introduced . Group Structure and Group Activity concepts are introduced and contrasted with other research used concepts of group functioning. The first part of the thesis includes the various variables included under these concept headings , presents a model of classifying Activity according to its decision-making or control purpose , and refers to appropriate research findings and models of groups and organisations .

Described in the thesis are two preliminary studies which led to the methodology and methods used in the main research . The main studies , carried out in groups attempting a complex business exercise and in management groups part

of British European Airways Corporation , measured variables related to Membership , Structure , Activity , and Performance and Structure and Activity , respectively .

The specific results [1] obtained in both phases of the research studies support the group functioning model , the variables and instruments developed , and the general form of the relationships between variables in different group functioning concepts . Anamount of material , using data not directly related to the specific models employed , but relevant to organisational groups , has been included .

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1. A summary of detailed research results is included in the thesis , p.240 .

Table of Contents

Volume I

	Page
Acknowledgements	1
Author's Notes	3
Section One : The Research Framework	4
1. Groups and Organisations	5
2. A Model of Membership , Structure , and Activity of Task directed Groups	23
3. The Research Methodology and Methods used in the B E A Studies	60
Section Two : Preliminary Research Studies	79
1. Preliminary Organisational Analysis : Using the Tracer System in Organisational Research	80
2. Preliminary Studies with Groups taking part in a Complex Business Exercise	96
Section Three : Research using Groups carrying out a Business Exercise	123
1. The Use of Groups carrying out a Business Exercise	124
2. The Financial Success of Groups	136
3. Measures of Group Membership	145
4. Structural Description of Groups	155
5. Recorded Group Activity	173
6. Relationships between Variables in the different Group Concepts in the Model	181
Section Four : Organisational Research using Management Groups in B E A	200
1. The Management Group Studies	201
2. General Results and the Group Structure Results	212
3. Group Activity and Structure / Activity Results	225
Summary of Results from Sections Two , Three and Four	240

Table of Contents (continued)

		Page
Volume II Title Page		245
Appendices		
Section One	Part 1	247
	Part 2	249
Section Two	Part 1	253
	Part 2	273
Section Three	Part 1	298
	Part 2	311
	Part 3	330
	Part 4	347
	Part 5	386
	Part 6	404
Section Four	Part 1	431
	Part 2	456
	Part 3	514
References and Bibliography		549

Acknowledgements

There are many people to whom I am indebted for their various assistance , guidance and interest in the studies described in this thesis which were carried out in British European Airways Corporation between September 1965 and March 1969 .

David Kitchen , Manager - Personnel Research and Development , was my liaison with BEA managers and contributed to the progress of the research from the experience of his own study of managers in British European Airways . Alan Spackman , Dr. Nicholas Blaine , Richard Coates and Michael Oatey were all comtemporaneous Research Fellows or Students at the Management Studies Research Unit at BEA during the period of this research and provided stimulation from other disciplines . Eli Abeles , another BEA Research Fellow , provided a more substantial assistance from his studies into the building of manpower analysis and prediction studies amongst certain departments in BEA .

Dr. William Barry , who began the Research Unit - and Dr. Keith Jackson who took over in 1969 , obtained a unique provision of facilities for organisational studies for all members of the unit .

The subjects of my research , over 500 junior and senior managers from British European Airways and from certain other european airlines , remain anonomous - but are heartily thanked for their co-operation.

I would like to acknowledge the assistance of the Management Engineering Department at the Imperial College of Science and Technology , under the leadership of Professor Samuel Eilon - and especially the Organisational Studies Unit (under various titles) and its complement of Research Assistants and members of staff .

Finally I wish to record the support and advice I received from my original Research Tutor , the late Professor Joan Woodward , and her successors as supervisors of the research , Dorothy Wedderburn - Research Tutor - and Dr. Don Harper , Industrial Sociology Unit , Imperial College .

Copenhagen Denmark
November 5 , 1972 .

Author's Notes

1. Because of the length of ancilliary material contained in appendices , this material - together reference and citation bibliography have been placed in a second volume . It is hoped that this arrangement will facilitate the cross reference between main tract and secondary material .

2. The amount of data which is presented in appendix form is more substantial than is usual in doctoral theses. It has been done for two reasons : -

    a. It is hoped that much of the "raw" data obtained will be useful for those interested in structure and activity within organisations - but whose theory model is different to that adopted by the author.

    b. Much data obtained early , in the formative period of the study described in section two of this thesis , is included as an illustration of the development of a scheme of research in an organisation rather than as a major contribution to organisation theory . Hopefully , it is of value to those planning studies of organisational structures and activities .

3. Nothing in this thesis should be interpreted as representing current British European Airways Corporation policy .

Section One

This section considers first the nature of model-building and research in contributions to knowledge about the work directed activities of members of large organisations . The differences in approach , field sources of data , and the methodology of the two schools of "Organisation" and "Group" theory are analysed . The lack of integrative theory about the role of groups and the results found within groups within a larger theory of organisations is identified as being a product of these factors rather than a confirmation of a real phenomenological difference .

A distinction is introduced in this section between relevant and non-relevant studies and research results with reference to the important characteristics of the work described in this thesis . This includes the type of simple model of group functioning proposed , the epistemological and methodological approach used and the details of the specific methods used in the study .

The section contains the form of the research design which was applied in a series of studies and which are described in sections three and four of this thesis . A more limited model was used in the sequence of preliminary studies which are reported in section two . They have been included in this thesis as they present trials of some of the specific methods which were used in the main research and directly determined the form of the final research scheme . The basis for these earlier studies is described in both this section and section two .

Part One : Groups and Organisations

This part of the thesis provides the reasons why the model of structure and activity in task-directed groups proposed and examined in a series of field studies contributes to Organisation Theory .

It is necessary to consider some of the results of research which have used groups , some taxonomies of group research applied to Organisation Theory and to derive some general conclusions about the criteria needed of group research to ensure relevance for substantive Organisation Theory .

There are no commonly accepted definitions of "organisation" and "group". This has exacerbated the existing confusion and lack of relatability between theory and research loosely classified under these two heads . But , there do exist two - well documented - series of concepts , constructs and associated systems of analysis concerned with the behaviour of people engaged on tasks . The distinction , between groups and organisations , is of the highest relevance to this research and will be examined at length . This thesis aims to develop a concept of a group which is related to an organisation in a series of definitions . The research described is an attempt to add to the theory of organisations and individuals activity in organisations through studies with groups which are part of or independent of a large economic organisation .

Strother (1963) , quoted by Weick[1] gives a very fluent description of an organisation :

" 1. Organisations are groups of two or more people .
2. In some kind of cooperative relationship to each other .

---

1. 1965 , page 208 .

3. This cooperation implies some kind of collective goal(s) or output(s) .
4. The groups exhibit some kind of differentiation of function amongst members .
5. Maintain some kind of more or less stable and explicit hierarchical structure .
6. Although not emphasised in the classical theories , it would seem essential that organisations exist in a total field : references to clientele , milieu , imputs , equilibrium and legitimisation indicate recognition of this fact . "

This summary does cover the main characteristics which have been associated with organisations . Other researchers have been interested in the notion of a single differentiating attribute :

" A system of consciously coordinated activities ( ) by two or more persons ." [1]

" Primacy of orientation to the attainment of a specific goal is used as the defining characteristic of a organisation which distinguishes it from other types of social system . " [2]

The distinction between what is actually a group and what an organisation has been less frequently attempted and is a direct result of the dichotomy of research and absence of dialogue between the " group " and " organisation " fields . Attempts at a composite theory of groups and organisations seems to have been avoided except in an illustrative [3] or theoretic way . Small group researchers in particular have developed their own limited and specific ranges of measuring instruments [4] and have used them over extensive periods without modification or attempting to move outside the concept of the small group .

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1. C.I.Barnard (1938) page 73 .
2. T.Parsons (1960) page 192 .
3. As in R. Likert (1961) " Linking pin " group concept .
4. For examples see R.F. Bales (I P A) and Schultz (F I R O)

The difficulty of relating small group research to the larger organisation has been recognised and some reasons for the existence of the two fields have been suggested : [1]

> " The congruity gap exists because few researchers have believed it is possible to conceptualise and explain inter-group and organisational system phenomena by the use of primary group concepts and theories . Simon (1960 page 157) stated his disbelief in such a method pointing out that primary group mechanisms cannot easily account for the corresponding phenomena in larger organisational aggregrates and that there are important organisational phenomena which do not have exact counterparts at the primary level . "

Parsons (1956) also makes plain the distinction between group and organisation research even though formal definitions are omitted . In his analysis he implies that both areas of study are necessary and he is not too concerned about the possible problems of integration :

> " (Organisations) can best be described and analysed from two points of view , both of which are essential to completeness. "
>
> " The first is the cultural-institutional point of view which uses the values of the system and their institutionalisation in different functional contexts as its point of departure. "
>
> " The second is the group or role point of view which takes the suborganisations and the roles of individuals participating in the functioning of the organisation as its point of departure . "

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1. Golembiewski op cit page 133 .

Research and theory since this was written supports Parson's conclusion . Both " points of view " have added to organisation theory . However the advance in our knowledge of organisations in total and our separate knowledge about the specific fields " organisation " and " group " would have been greater if clear and accepted definitions of the sub-disciplines had been used .

Not only have the models and associated variables considered in group and organisation research been usually incompatible as a result , but also the methodologies and specific methods employed have been very different . But the allegiance to a specific system is not often made plain . J.Woodward is an example of an exception :

> " The research into organisational structure and behaviour at Imperial College takes as its unit of analysis the organisation . "

During recent years there have been some successful transfer of methods between the two fields [1] but the majority of current research can still be categorised under one of the two disciplines - with their implict differences in research systems and methods . But the disciplines are not , as yet , distinguished by a series of definitions related to concepts which can be thought common to both . As this research is an attempt to use theory and studies with groups to add to organisation theory the development of group research and the differential relevance for organisations of research results has been considered . Only points which have immediate relevance to the specific model and methodology proposed in in this thesis are raised : there is no possibility for a comprehensive treatment [2] .

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1. D.Pugh (1966 and 1970) has used factor analysis techniques first used for characterising basic personality features (see Cattell et alia 1953) on a wide and untraditional range of organisational variables . In addition the 'focus' in this series of studies has changed from organisation measures to individual and group measures.

2. The output of " small group " research was already 200 articles a year by 1962 . See Golembiewski page 87 in J.March (1965) .

The study of groups has been closely connected to the concepts of social psychology since the identification of the important effect of the primary working groups in determining individual working behaviour in the Western Electric studies .[1] Perhaps surprisingly the majority of groups which have been used in distinct schemes of research have had an existence outside an organisational structure[2] - like the early Western Electric studies . The use of non-organisation groupshas been determined by the ready availability of this type of group for research study and the perceived opportunities for experimental control over some group variables . Much research which has been carried out with groups which are part of a larger organisation belong to this category as , in order to study the group , it is necessary to isolate it from contact with other units within the organisation[3] . In addition , there has been an excess of studies with working groups at the shop-floor level partly due ease of availability but also because of some physical characteristics of such groups . They work in the same location with each other and the nature of tasks that are performed and the distribution of these tasks among group members is obvious . Research using groups created in the laboratory[4] has the physical presence of group members at all times and has sometimes used specific tasks but these have seldom been organisational relevant .

The concept of groups which is most useful in the characterisation and distinction between group studies of various genre is the nature of the task which the group performs . The existence of a dimension or a series of dimensions for tasks performed by groups has been recognised in theory but few practical steps have been made to use a realistic scheme of task description which would make classification of studies

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1. As presented in M. Vitales (1948)
2. See McGrath and Altman (1966) .
3. In the Western Electric studies , for example , the groups were created for experimental purposes and the differentiation between the studies group and the remainder of the group was reinforced by both management and the research team . In the Bank wiring experiment physical separation was rigidly enforced .
4. Laboratory meaning a composition and task which is under the control of the researcher .

possible [1] . At one end of the dimension there is research where the tasks are general and not capable of differentiation . Concepts which have developed with research involving this kind of task include leadership , role styles and cohesiveness . At the other extreme there are studies with groups where the tasks are concrete , prescribed in detail and frequently capable of sub-division[2] . The set of variables most often considered in this type of study relates to communication : the amount , direction , patterns and content , and the initiators of particular interactive episodes [3]. While the first type of studies have been exclusively carried out in groups without any real connection with an organisation the studies with groups forming the second type of tasks have taken place with both organisation and non-organisation related groups . Golembiewski comments on the extant situation in small group research as follows :

> " Researchers have developed a wide variety of variables describing small group properties and processes . Therefore it would be presumptiousto pick a set of concepts adequate for group description at this time . The significant limitations of existing attempts to tackle the development of sets of comprehensive group dimensions provide strong support for this hestitance . Even stronger support derives from the general lack of interest in the problem . "

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1. The same situation is found in the "task analysis" approach to organisation theory and research. T.Kynaston Reeves(1972) says in a review of research under the "task analysis" head : " The conclusion of the seven (J.Lawrence , P.Lorsch , J.Woodward , S.Udy , J.Thompson , C.Perrow and G.Bell) ... was that the common factor linking their work was that they all , in some way or other , were concerned with studying tasks of organisations and the relationship between tasks and organisation .
2. Most "small group" researchers would not consider these studies as belonging to a common field of study .
3. Although Leavitt (1955) and Bavelas (1956) were the first to apply these concepts to non-organisational groups similar schemes had been carried out by both S.Carlson (1951) and T.Burns (1954). See H.Guetzkow (1965) for a summary of this type of research .

and continues [1]:

> " The analyst of the literature still faces a choice among :
>
> 1. The same concept defined in different operational terms in different studies .
> 2. Similar concepts defined in different term in different studies .
> 3. Similar concepts defined in similar operational terms in different studies .
>
> and 4. Significantly different conceptualisations which purport to tap a similar phenomenal area and which are defined in different operational terms . "

Substantially similar problems exist and have been recognised in the attempts which have been made to extend the results found for groups into either organisation - based groups or total organisations . Golembiewski [2] provides a further example :

> " . . . . most common alternative conception is that the small group can serve as a 'miniature' of a formal organisation (see Demereth and Thibaut 1956) ... the senses in which this is the case , however , have never been made particularly clear . Indeed , the conception seems based more upon congeniality and convenience than upon systematic demonstration . ... however the crucial question is the validity of the concept inducing the convenient and congenial concept . "

Further support for this point of view comes from Leavitt and Bass [3] :

> " . . . in general the extrapolations from small group data have been free and easy , without much documentation . "

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1. Page 90 .
2. Page 104 .
3. 1964 , page 379 .

However there are some dissenting opinions [1] :

> " At the present stage of development in organisation theory , it seems that so-called organisation behaviour differs little from so-called laboratory behaviour and that small groups resemble large organisations . "

There have been attempts to clarify the relevance of "group" research for organisations through paradigms of the categories of group model available and their relative value for organisation theory. M.Zelditch and T.Hopkin , for example , although specifically concerned with the use of experimental methods , developed a taxonomy of verisimilartude of organisation simulations [2] :

> " The miniature replica
> The part replica
> The 'near' organisation
> and The simple structured unit . "

Zelditch and Hopkin have assessed each in terms of possible contributions to the theory of organisations . But experiments with groups have not, in general, been selected by researchers in the light of the potential relevance of the project and the results to organisation theory . But there are many research studies using groups where the 'group' used can be characterised as either a miniature , part replica or as a near organisation in Zelditch and Hopkin's definition . But singularly neglected in research is one sub-category which is discussed by Zelditch and Hopkin in a few lines [3] :

> " First , sub-units within an organisation may behave in various respects like a 'simple structured unit'. "

The sub-units they are refering to are organisational groups , which are identified by the organisation itself as departments , section etc. These sub-units in organisations are primarily

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1. Golembiewski op cit page 202 .
2. Pages 472 - 473 .
3. Page 477 .

organised about a singe or group of tasks which generally relate to each other and to a specified or assumed series of goals .

The object of the research described in this thesis was to examine groups which were part of a large organisation together with other groups which were not part of a organisation , but which performed organisational-like tasks [1] . There is no attempt to deduce organisation theory which is applicable to whole organisations . The following sequence indicates the manner in which the research aims to add to knowledge about organisations .

1. The relevance of research results obtained from simulated groups for groups which are part of a large organisations .

2. The relevance of results found in groups within one organisation for general theory about group functioning in organisations .

The value of such research to organisation theory depends on how important the group sub-structure of organisations is in determining both individual and cumulative behaviour in organisations . It is at least promising that real organisations themselves define their internal structure , task and , sometimes , objectives in terms of a sub-unit which has in common parlance been called the group .

This use of group study is more limited than that suggested by Seiler [2] , but has received as little attention in research even if it has been popular in some general syntheses [3] .

> " . . . there is an alternative . . . that alternative is to press primary group concepts to their utmost limits to describe and explain organisational phenomena and to invent additional concepts only

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1. In the rest of thesis such groups are termed ' simulated ' groups .
2. 1965 pages 190 - 198 .
3. K.E. Weick (1965) page 202 .

when and to the extent that available primary group concepts prove inadequate . This alternative has not been properly tested .

This thesis is dependent on a more limited hypothesis concerning groups and organisations . The knowledge of the structure and activity of individual groups within an organisation - studied as separate units in isolation from the rest of the organisation - is proposed as means of adding to relevant knowledge about organisations .

The definition of a group which is used in this research is that a group is a number of people who , because of the demands required for the completion of an alloted (or adopted) task , have to communicate with each other . The necessity for contact must be recognised , either through close physical presence or through the provision of a medium for communication . The characteristics of the task which require communication between group members can be various . The tasks carried out by individuals in a group may be differentiated but requiring ' co-ordination ' or (at the extreme of a dimension) there may only be common tasks in which all participate .

An organisation in this research is either a single group or a collection of groups which has a task and goal structure which is under its own control .

Although research involving groups in organisations has not been frequent there is evidence that the great majority of people in large organisations are members of work groups which are internally recognised . Weiss and Jacobsen [1] , one of the few who have used groups as a basis for organisational analysis found :

" 82 % of the respondents [2] could be classed as members of 22 primary separate working groups that formed the basic framework of the organisation . "

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1. 1955 page 666 .

2. Respondents to a sociometric choice question .

Apart from the actual membership of groups the activity of single individuals is reported as dominated by the group [1] :

> " these people had the bulk of their contacts within their respective groups "

The growth in the use of group methods in both training and organisational development [2] has not been followed by an extensive increase in the amount and quality of research - either analytical or theory building - aimed at clarrifying the importance of the group as an organisational entity . This is particularly true of management group studies where the early work of Burns and Carlson has not been developed except for changes in the detailed methods used [3] . Management groups are several degrees more complex than groups directly concerned with the primary productive process . There is more " structure " - a greater number of status levels and complex and uncertain differentiation of tasks - and substantial problems of activity analysis occassioned by the use of three different modes of communication [4] exist . The use of management groups in this study reflects both the facilities made available to the researcher in the study [5] and an interest in structure and activity with organisational groups concerned mostly with mental tasks where both both individual [6] and interactive episodes are necessary for the completion of tasks .

There is a further reason why the study of organisations can succesfully be carried out at the level of the management group . Many current writers are concerned about the relevance to organisations about the research which is carried out in organisations . As an example J.Rackham says [7] :

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1. Weiss and Jacobsen op cit
2. See , for example , E.Schein and W.Bennis (1965) and T.Morgan (1971)
3. See J.H. Horne and T. Lupton (1965) .
4. Namely , face-to-face, written and telephone communication .
5. Appendix 1.1 contains a discussion about facilities and organisational research with specific reference to facilities available in British European Airways .
6. An ' individual ' episode in this research is an episode where no communication takes place between people . An ' interactive ' episode contains communication .
7. 1968 page 335 .

" Ultimately the purpose of Organisation Theory is to provide guidance for managers faced with the problems of the design of organisations . "

But organisation theories have been neither designed nor have research projects formulated , to achieve this objective . Appendix 1.1 considers the problem of the usefulness of organisation research results and particularly the modification of organisations during the progress of a research study . There are some distinct reasons why research involving groups is likely to produce results which are more applicable than studies which attempt to consider whole organisations [1] . Change in organisations is brought about through analysis and modification at the group/departmental level - not through diagnosis and edict covering all members of an organisation . Theories emphasising the importance of the characteristics of individuals in the design of organisations have gained support and methods of the development and training of organisation members through analysis of each individual's " work "[2] and " people situation "[3] with reference to his department . Findings about organisations at the level of the group would have a possible impact on the development of effective means of improving performance both at the group and individual level .

Further consideration of the general applicability of group research to organisation theory is dependent on the particular model of group functioning presented in this thesis and used as a basis for organisational analysis . This model considers the main attributes of groups - which are either part of , or independent of , a large organisation - under the three heads of Membership , Structure , and Activity .

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1. As examples of studies which attempted analyses of total organisations but which did not produce a " manager's guide " to organisational improvement see early structural measures of D.Pugh (1966) and the S.E.Essex studies of J.Woodward (1958)

2. See , as an example , the report by A.Mant (1970)
3. For two opposing views , but both using group methods of developing " people " skills , see P.B. Smith (1969) and J. Hall (1970) . T. Morgan (1971) gives an extensive and bibliography .

In addition , the group is perceived as having an organisational determined input , the task and a distinct output . This output various according to the nature of the task which a group performs but is variously , the product , the plan , the series of decisions etc. It is essential to consider these extensions of the internal model of group functioning on the organisational relevance of this research as they represent the important intermediary between the total organisation and the groups contained within it .

As in other areas of organisation theory there is a history of these " extensions " to the group functioning model being neither extensively described or defined . The concepts of task , performance and also goals [1] have become confused and overlapping in organisation and group based studies . Parsons[2] , for instance , selected goals as his prime concept :

> " Organisations are social units devoted primarily to the attainment of specific goals . "

" Attainment " implies not only that a task is involved but also a measure of performance , that is , actual completion of required tasks . In the study of groups the concept of task which has been most to the fore (even if rarely defined) Weick summarises [3] :

> " (a task has the following characteristics ...)
> 1. A task is imposed on the group either by someone external to the group or by the group itself .
> 2. Task performance is responsive to demands other than those which are directly imposed .
> 3. A task includes an objective plus a set of means to attain this end .
>
> and 4. Tasks vary in the individual and group processes which they make salient .

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1. Also known under the term objectives .
2. 1960 page 17 .
3. 1965 page 228 .

The written goals of organisations often include both a task description and a performance measure [1] . And there is an increasing tendancy for units within complex organisations to be similarly provided with both written objectives and measures of performance [2] .

Research with small groups , especialy studies which have aimed at verisimilartude and comparibility of results with other studies , has been productive in the consideration of task descriptions of both groups and members of groups . For most research the description of a task given by Thibaut and Kelley [3] is insufficient :

> " A task is a problem , assignment or stimulus complex to which the individual responds by performing various covert or overt operations which lead to various outcomes . [4] "

Attempts to be more specific produce definitions of tasks in terms of the activities (of the group) or behaviour (of individuals) that are a response to directed tasks . For example [5] :

> " We may expect that the most useful method of classifying group tasks will be with reference to those aspects of group behaviour or procedures which these tasks bring to the foreground . The distinctive features of the particular task will be the degree to which they require group behaviour for adequate performance ."

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1. For B.E.A. , the organisation providing the facilities for this research , the legal objectives are explicit in the Air Corporations Acts (various but see 1947) . These are :-
   1. Participate in Air Transport and related activitie - this relates to task .
   2. Earnings on capital employed - this relates to performance .
2. " Management by Objectives and allied exercises " . For a discussion of performance measures in organisations see S.Tribe (1973) .
3. Quoted by Weick (1965) page 229 .
4. Again a task and performance element are contained in this definition .
5. Roby and Lanzetta (1958) page 95 .

The predominance of researchers who have described tasks in terms of secondary variables and the substantial research which has gone into the basic nature of tasks [1] suggested early in the study that a scheme in which tasks would have to be specified would not be possible with the facilities available for this research . The nature of the tasks carried out by the non-organisation groups , which is an important source of field results in this study , is still relevant . Roby and Lanzetta say in criticising the tasks required of many simulated groups : [2]

> " (the task is) . . . construed only as a device for ensuring a certain level of social interaction among group members "

This requirement of a group task is quite insufficient for studies were applicability , or at least comparibility , of results to real organisations and their groups is sought . Weick [2] identifies that :

> " .... most tasks are chosen to test hypotheses and not to produce applicability of data . "

but continues in defence of the researchers whose work he is reviewing :

> " Unfortunately little is known about what constitutes a judicious choice of task . "

In this series of studies the tasks required of simulated groups meet those characteristics of tasks , identified by Weick , listed on page 17 . The groups take part in a complex business exercise [3] through the coming to decisions about a series of management areas . Parsons [4] has indicated how central this decision - making activity is in comparison to other internal organisation factors :

> " In its internal reference , the primacy of goal attainment among the functions of a social system gives priority to those processes which most

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1. For instance, R.Gagné (1964)
2. Op cit page 88
3. For a detailed description of this exercise see section two .
4. 1956 page 63 .

> directly involved with the success or failure of goal - oriented endeavours . This means essentially the decision - making process , which controls the utilisation of the resources of the system as a whole in the interests of the goal . "

While effort has gone into making the simulation of management groups in terms of the decision - making with respect to the required task there is little information , even of a practical kind - about the actual decision - making activity in real organisational groups . Before this research a similarity between the tasks and required decisions in management exercises and the corresponding characterisics in management groups had been assumed and had frequently been proposed as a justification for the use of complex business exercises in the training of managers . The results of this thesis , apart from assessing value of the model and the data obtained , represents an opportunity to compare and evaluate the structure and activity in real and simulated management groups .

A final note in this examination of the task , goal and performance attributes of groups related to the model of group function is concerned with the performance of groups and group members . No public information about the ability of an organisation to provide a system of performance measures for either organisational groups or members of groups is of use for organisational analysis . The attempts to provide such measures [1] are merely described and realistic assessments of systems in use have not been given . The novelty of systems of providing internal performance measures shows the inadequacy of existing informal feedback about work success in organisations [2] . But in the small group experiment , and particularly in studies in which business exercises are utilised , such information about recent performance in completing tasks is easily available . The effect of feedback about performance on the functioning of the group may be very considerable and reduce the value of the simulation .

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1. For example , through " Internal costing " where one department makes a charge on its services to another department .
2. A recent attempt to build a system of feedback of information about performance , starting with sources of information rather than objective setting , has been described . S.B.Tribe (1973) .

Group studies have , in general , ignored the dynamic effect which such information may cause on the internal group functioning . Past performance which can be recognised by the group as successful or unsuccessful may encourage groups to stabilise or reorganise their structure and activities to[1] deal with further tasks and decisions . But the comments made by Weick with respect to the effect of feedback information is probably also relevant for many simulated groups and their task , objective and performance structure :[2]

> " Within actual organisations , it is probably true that (performance) feedback does not permit accurate placement of the ' cause ' of a particular outcome . "

However in any studies with simulated groups with feedback about performance the possible effects of knowledge of results and post facto identification of causes of success or failure may induce effects on the internal functioning of groups which is absent in real organisational counterparts .

The definition of a group described in this section and used in this research includes many ' associations ' of people carrying out tasks which are excluded in other uses of the term group . In particular , no ' clue ' has been provided as to when an association of people carrying out tasks can be considered as being made up of two , three or more groups rather than a single larger group . Some definitions have , for instance , included reference to the structure[3] as a means of deciding the exact limits of particular groups . The notion of characterising a group in relation to joint activity - other members of a ' group ' with whom them have most contact in the accomplishment of tasks - is also popular . In real organisations unitary groups (in the sense that all interaction takes place within the group) do not exist within the usual organisation structure . The only groups which have a total resemblance to the unitary small group of group studies are organisational committees and allied

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1. However , hopefully , McGrath and Altman op cit indicate page 149 that neither the nature of " intra group communication " or the"patterns of interaction" were effected by feedback about performance in various unclassified research
2. op cit page 221 .
3. Likert (1958) and successors have used status differences

temporary structures . But these forms of structure are not yet integrated into the main direction of organisation theory[1] But using the concept of task as the main defining characteristic in defining a group a certain amount of relevance to real organisational groups is ensured for results obtained with simulated groups . The organisation , itself , defines its own sub-structures in terms of task and not in terms of defining the interaction between organisation members [2]. The model described in this thesis and used in a series of studies , therefore , follows the main requirements of a " task analysis " approach to organisation theory and analysis The most important difference in the strategy of this research compared with other approaches is the absence of the use of any dimension of task description [3].

---

1. Even though , as they represent attempts to carry out tasks which have been found impossible or inconvenient within the normal hierarchical and departmentalised organisation structure , they have important implications .
2. A later part of this section considers research with groups where control has been exercised over patterns of interaction resulting from groups attempting tasks .
3. Compare , for example , with the differentiation concept of Lawrence and Lorsch (1966) and the sub-task measures of technology of J.Woodward (1958) .

Part Two : A Model of the Membership , Structure and Activity of Task directed Groups of relevance for Organisation Theory .

The general use , form, and content of models of group functioning - with associated measures and variables developed in studies of groups and organisations-is examined within this chapter . A simple model of group functioning of particular relevance to organisational groups is proposed . A definition of the group concepts of Membership , Structure and Activity is given together with a description of variables contained under each of these heads . Relationships between the variable types within the outlined model and analogous or contrasting measures used in other studies are explained . It is suggested that there is a distinct absence of earlier research which has used a total framework model of group functioning as is described in this thesis . Additionally , the invalidity of many studies with groups which have sought organisational relevance is proposed . One particularly important reason suggested is the treatment of important , essentially dynamic , variables as independent variables in many schemes of research .

The special relationship that the model has with the " conceptual map " of the Imperial College / South East Essex studies [1] is outlined in this chapter . The model developed contains a recognition of the importance of both a control and decision -making structure , with the " Structure " concept and of control and decision-making activity in the " Activity " concepts in the proposed model of group functioning . A specific scheme of classifying group (and individual activity within a group) activity directed towards the completing of tasks through categorising according to a model of control and decision-making has been developed .

- - - - - - - - - - - - - - - - - -

1. See S.S.R.C. Research Reports (1966 - 1971)

Groups have not been used to any extent as a means of testing theories of organisation . This has been brought about by the lack of extensive theory and the characteristics of proposed organisation models which has been noted by Weick [1] :

> " Those theories of organisation which do exist tend to be non-specific because they are based on field studies and informed speculations . Because many of the propositions found in these theories are abstract and only vaguely tied to empirical events , it is difficult to test them . "

There is a research strategy , common to many studies , where a series of variables (sometimes related to concepts) are developed and where the results are only a group of partial correlation coefficient tables . When more general models have been proposed the frequently hypothesised " interaction " between parts of the model [2] makes the testing for causal effects - rather than association - not possible . Many research , as a consequence , have a similar inutility to group theory types noted by R.Cattell [3].

> " Hypotheses and experimental designs in group research deals with :
>
> a. the properties of groups
>
> and b. the characteristics of individuals in relation to one another and to various influences .
>
> It has astonished the present researchers that many serious writers are apparently prepared to indulge in verbally involved theories without having investigated the first essential fundament in these relations . . . the dimensions along which the attributes of any group are to be measured . "

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1. op cit , page 206 .
2. Appendix 2.1 gives a non-representative and uncritical selection of some of the simpler models of group / organistion " functioning " which have been proposed . The chosen models all have some points of resemblance to the model used in this research .
3. et alia (1953) page 331 .

In any research scheme where the comparibility between different groups in organisations and where relevance of results for the theory of complex organisations is sought then these requirements noted by Cattell are paramount . But , in addition , the requirement of successful and relevant measurement should not be at the expense of model building and even plain description where this is genuinely adding to our knowledge about organisations . The wider usefulness of research results - beyond the tight formulation of variables and measures - cannot be ignored at the present stage of knowledge about organisations and groups .

When theory building has not been attempted in research a kind of model formulation is implicit in the categories of variables which have been associated with groups . Cattell and co-workers did this [1] :

> " One of the main concepts of our work is that the description and measurement of a group requires data on three panels :
>
> a. population characteristics - the statistics of the distribution of traits of the individual group members such as for example , general intelligence .
>
> b. structure , for example , form of leadership , status , roles , interaction etc.
>
> and c. syntality , that which is defined by the attributes of the group as a group , that is , by its measured performances as an integrated whole . "

There are more recent formulations with a similar implicit content : P.F. Lazarsfield and H. Menzel [2] describe three kinds of " properties " which describe " collectives " (groups and organisations) :

> " a. Analytical properties based on data about each member .

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1. op cit , page 333 .

2. 1961 , page 408

b. Structural properties , based on data about the relations among members .

c. Global properties , not based on information about the properties of individuals .

Relationships between Variables

While there is a dearth of comprehensive theory building concerning groups which would facilitate the integration of results found for groups into organisation theory there is a quantity of research which link several variables . McGrath and Altman , in their analyses [1] of the variables and results of group research , found that there were many sets of relationships between variables which had either been ignored or very little studied . In their section on General Abilities [2] they identify that there have been no tests carried out with general structural properties and only a very little with measures of member and group performance and measures of group task performance . The absence of research systematically measuring the structure [3] of groups and organisations is particularly notable in this review and is commented on elsewhere [4] .

> " Relative lack of systematic ... research on the impact of structural variables on organisation behaviour is regularly cited .
>
> ... with a few notable exceptions , organisational students have , in fact , tended to concentrate on attitudinal , demographical and personality variables . "

The relationship between the personality characteristics and task performance has been such an area [5] . Krech and Crutchfield

---

1. 1966.
2. Pages 110 - 112
3. Used here with definition : patterns of recognised relationships between group members developed as a response to required group tasks .
4. C.V. Blankenship and E.M. Miles (1968) .
5. See , for example , R.D. Mann's review (1959) and McGrath and Altman , op cit , pages 108 - 110 .

category of Intermediate Variables [1] includes a range of highly popular measures . Leadership , a characteristic most persistently investigated , has also been shown to be the area producing the most contradictory results [2] . In a contrasting field of study , the analysis of communication and performance of " teams " with restricted interpersonal access , as much contradiction in results has been found [3] . The reasons which have been given for the failure of existing studies in both these referenced reviews is the too restricted conceptual model used by the researchers . Glanzer and Glaser [4] introduce the importance of the task carried out by the group to account for conflicting results [5] . Cartwright and Zander [6] identify more directly a trend in leadership studies which moves towards a wider theory of groups :

> " Dissatisfaction ... has , then , given rise to a view of leadership that stresses the characteristics of the group and the situation in which it exists .
>
> ... situational aspects such as the nature of the group's goals , the structure of the group , the attitudes or needs of the members , and the expectations placed on the group by its external environment help to determine which group functions will be needed at any given time . "

Unfortunately , there is no evidence that the research carried out with a few variables , like these cited leadership and communication studies , has been developed , or is capable of being developed , into more comprehensive theory with research with increasing number of variables . Only in a more substantial theory with concepts covering all major aspects of group functioning can the consideration of " special " group concepts , like communication and leadership , be made in a way which will produce relevant results . It is not

---

1. See the illustration of the model in appendix 2.1 .
2. See Section 5 - and especially page 102 - D. Cartwright and A. Zander (1968) .
3. M. Glanzer and R.Glaser (1961) . Like the leadership example this field of study has a highly developed methodology
4. Page 4 .
5. Implicitly suggesting an extension of the model of groups .
6. op cit page 304 .

perhaps not insignificant that most model building quoted in this section is found in review articles where attempts have been made to produce a more total theory of groups or organisations in order to categorise (rather than relate) the results of individual research . The research formulated and carried out and described in this thesis represents an attempt to create a total conceptual model of group functioning within organisations and to examine a series of concepts and variables within that model which seem to have both importance to real organisational groups and are capable of operational measurement .

The South East Essex / Imperial College Studies [1]

The research carried out from 1954 by J. Woodward and associates represented the use of a model of organisation [2] which has many points of similarity to the models of groups and organisations already summarised [3] . There is close correspondence between a number of specific parts of the model and actual variables in the Woodward research with some total group theory or research . In particular the development of interest in the effects of technology on the characteristics of an organisation is paralleled by the group researchers realisation of the importance of the the nature of the group task [4] on group phenomena . And similar problems exist :

> " Technology turns out to be multidimensional " [5]
>
> " ... the vast majority of tasks used in small group research defy a parametric analysis in terms proposed ... and possibly in any other terms as well . " [6]

However the most important resemblance between the Woodward model and group theory is the identification of specific

---

1. See , for example , J. Woodward (1965)
2. Summarised in author's own formulation as appendix 2.2 .
3. Appendix 2.1 .
4. See , for example , C. Faucheux and K.D. MacKenzie (1966)
5. J. Rackham (1968) page 348 .
6. R.B. Zajonc (1965) page 71 .

organisational structures associated with organisation success for given technologies [1] and the general finding from group studies [2] that general structure properties of groups are moderately related [3] to group task performance .

The research scheme as developed within in BEA was originally conceived as a test , within a service organisation with non-productive activity , of some of the concepts in current use [4] in the S S R C sponsored research being undertaken at the Management Engineering section at Imperial College . This was to be achieved by the use of the tracer-method by following the sequence of organisation members involved and their activities resulting from an initial important decision .[5] In an attempt to characterise the activities of people in the organisation a system of classifying behaviour as to its control or decision-making purpose was devised . A preliminary " tracer " study was carried in part of BEA using the main concepts of the contemporary Imperial College [6] . The results of this study [7] were useful only in clarrifying methods of obtaining data and in identifying the management group as important sub-unit with the organisational structure . The research was redesigned at this time with the aim of adding to the knowledge of organisations through a broad and precise measurement of group variables which has relevance to all groups that are task-directed . A strategy , like the Woodward study , of obtaining what structural variables are available, has been avoided because of the results of the early study in BEA .

The changes which took place in the research design at the end of the first organisational study were twofold . Apart from the developing emphasis on sub-units within organisations , there was a move away from an examination of decision-making and control systems towards a measurement of the individual's

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1. In Woodward's use more properly production systems .
2. McGrath and Altman op cit .
3. Moderately related in the McGrath and Altman analyses represents correlation coefficients in the range 0.20 to 0.30
4. End of 1965 .
5. An extensive description of the tracer method is included in section 2 part 1 .
6. Autumn 1966 .
7. Described in this thesis in section 2 part 1 .

and group's task structure in terms of a model of decision-making and control . Implicit in these two prime developments in the study was a substantially different methodology and - by the use of measuring instruments - a greater availability of quantitative data .

A conceptual model of groups concerned with task accomplishment

The model of group functioning developed and used in the later studies described in this thesis [1] have resemblance with other theories of groups and the research framework of the Imperial College studies [2]. The model proposes that within organisational groups and certain groups which are not parts of large organisations but which have a complex task to be performed , there are three important and conceptually different classes of variables .
These are :

a. Membership
b. Structure
and c. Activity

For groups which are concerned with the completion of complex and differentiated tasks a proposal was made and tested in this research that there is a distinct causal relationship between certain membership variables and structure variables . A similar proposal that structure variables can be held responsible for activity variables was considered . Membership variables have an effect on the Activity associated with groups through the intermediary of Structure . A further proposition considers the relationship between these variables and the task performance . It is suggested that Group Activity , Structure and Membership variables (in this diminishing order) can be found associated with group task performance .

The first part of the research following this scheme was planned to allow a test of the relationships between all parts of the proposed model through the use of a simulated task capable of reproduction to produce the substantial number of results necessary for statistical treatments of data .

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1. Sections three and four .

2. Appendices 2.1 and 2.2 respectively .

Even in an organisation as large as British European Airways [1] it is not possible to obtain enough groups performing identical tasks in the numbers required for statistical analysis .[2] Although the measurement of performance is not as difficult a theoretical problem as the characterisation of group and organisation tasks it was foreseen as possibly intractible in the field situation [3]. Finally , as a factor effecting what part of the research formulation could actually be applied in groups within a real organisation , was early knowledge about what measurements could be asked of organisation members . Certain biographic material was available from files but there was possibility of a series of " cold " psychometric measurement through questionnaires and inventory methods .
The second series of studies described in this thesis considers only a part of the total model - the relationship between the Structure and the Activity in groups - as a direct consequence . Further consideration of this model of group functioning , the actual scheme of the research , and the use of the various parts in this model is made when an analysis of research methodologies in organisation theory is presented .
The remainder of this section deals with each of the concepts of the model of groups , and considersthe boundaries of previous concepts , specific variables used in research and the results of some relevant studies .

Membership

Membership variables are those variables relating to the individuals and the group as a whole which have a real existence (for the individual or group) outside the actual membership of the group . It is possible to detect in the literature the use of four distinct sub-categories of measured variables which characterise the individuals making up groups and which correspond to this definition . These have been used to different extents and in many different ways .

---

1. More than 20,000 employees in 1966 .
2. In addition , the situational characteristics of groups of staff , apparently engaged on identical tasks , were found to have an influence on activity within the group , see section 2 part 1 .
3. Productivity measures are the only commonly available measure See Trist and Bamforth (1954) and Lodahl and Porter (1961

These sub-categories are :

a. Personality Characteristics .

b. General Abilities .

c. General Biographic Characteristics .

d. Biographic Characteristics relating to Organisational membership .

Membership variables are considered under these four categories

Personality Characteristics

The use of measures of personality characteristics has been most common - especially in studies in which the performance of the group has been obtained in some manner . This domination by personality tests and measures over the other membership variables is perhaps due to the development of some validated general personality inventories during a period of extensive growth in psychologists'interest in groups [1] . This use of tests appears to be related to the possibility of producing some genuine predictors (and therefore a basis for selection) of group members for high group performance . The users of personality measures have frequently neglected other variables available even though in the field of industrial selection there is a general result that information about past performanc and education achievements have given better correlations with individuals performance in large organisation [2] .
Apart from the general personality questionnaire used in group situations specific questionnaires have been evolved for measuring characteristics considered important within particular theories of group functioning . Schutz's Fundamental Interpersonal Relations Orientation [3] scale is an example of such a measure based on a needs model of inter-personal activity in groups . A recent example , in which this scale was used , continues a tradition of disinterest in other variables [4] and where the group task has been merely described

1. See , for example , the use of Ghiselli (1954) Self Description Inventory in L.W. Porter (1961)and Cattell's 16.PF used in group studies (1953).
2. Which must be effected by the performance of the group he is a member of .
3. W.C. Schutz (1958)
4. Especially structure variables .

and not included as part of a general synthesis of group functioning and performance . However , the absence of important structure measures has been noted in this cited study [1] :

> " It would appear , however , that the examination of sub-group phenomena in this study has indicated that this area is theoretically (sic) more complex than originally assumed and that it requires more systematic investigation and analysis .

Similar end-of-research comments have been made in the report of a study using groups which taken part in a complex business exercise [2] :

> " From the findings of this research two broad areas seem worthy of study , vis, heterogeneous group composition and the development of emergent group structures . "

Crawford [3] using a corresponding complex business exercise with groups made some examination of group structure although his research was concerned only with membership and performance measures [4] . The predominance of studies which have examined behaviour and group performance related to personality measures in non-organisation groups indicates the political difficulties which may make such studies impossible in groups in real organisations . Even in studies involving simulated groups drawn from one organisation such problems may be present[5]

> " ... the amount of time which could be allowed and to a greater extent , the political limitation of what members could be reasonably asked to do in th the way of psychological tests , questionnaires and the like . "

One of the most useful studies where a psychometric battery was used with real organisational groups were the studies in

---

1. W.Shalinsky (1968) page 463 .
2. B.W. Tuckman (1964) page 487 .
3. 1967 research in BEA .
4. op cit pages 128 - 129 .
5. Crawford op cit page 42 .

maintenance groups of United Airlines [1] . This research succeded an earlier study [2] which had not used groups with organisational affiliation and is a representative of a very small number of group research which has sought organisational relevance .

The manner in which the scores [3] of members of groups have been used in hypothesis testing varies significantly . The mean value of a score on a specific measure is the most frequently used derived statistic brought into tests for relationship - even though the variance associated with personality scores within a group had been found of predictive value in an early study [4] . The low total of studies where the variance in the scores of group members is partly due to the frequency of a research strategy where pyschometric and other membership characteristics have been obtained only to manipulate group membership with respect to these variables [5] . Further group summaries have been proposed and used in a few studies . Some studies have involved the identification of a leader and contrasted the score of that member with the average of the group . These studies [6] have been carried out with work or management groups where there has been a recognised status distinction between a single group member and the remainder of the group . A final derived statistic has been the description of the characteristics of membership scores associated with groups in terms of the skewness found in the distribution for that measure - but this has only been used ocassionally [7] .

---

1. A population of 62 work groups , containing between 4 and 13 members. See pages 72 - 73 T.M. Lodahl and L.W. Porter (1961)
2. Ghiselli and Lodahl (1958)
3. The following paragraph applies to all membership sub-categories measures .
4. R.B. Cattell (1953) page 354 .
5. Using creating groups of high homogeneity . See , for example W.Haythorn et alia (1956) where the measure is a score on authoritarian / equalitarian attitude .
6. F. Friedlander (1966) measured the leader - group distance in various " demographic " characteristics in 12 working groups (management committees) . T.M. Lodahl and L.W. Porte op cit used a similar statistic - the " leadman's " procentile position in the group . See page 75 .
7. Lodahl and Porter op cit page 74 .

The multiplicity of personality measures used in group research [1] makes a short review of the types and general results of such research impossible . McGrath and Altman , in their summary [2] of small group research,show that,in the neglected area of relationship tests between personality characteristics and general structural properties of groups , there have results with " high / moderate " correlations . The frequency of comments made by researchers as to the important possible role of intermediate (structural) variables has already been raised . One research finding of special interest is that made by Lodahl and Porter : [3]

> " It was found that the strongest relationships between the predictor variables and productivity were in groups where the necessity for cooperation was high . It was concluded that the patterns of psychometric scores in industrial work groups may bear some relation to group productivity , but this relation is effected by social characteristics of the group ... "

Apart from supporting the membership / structure / activity - performance model,this result also confirms the task dependency of the relationships and also proposes the direction of effect of a dimension of task measurement on the model [4] .

General Abilities

The group of variables classed under this heading include measures of general intelligence in addition to tests of aptitude and performance related to the tasks of the group . Heslin has reviewed the results of work up to 1964 [5] and a more recent research report found this the latest

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1. Although research identified in this section has used only inventories some projective methods have been used . For example , Sentence completion and situation interpretation tests .
2. op cit page 74 .
3. op cit page 78 .
4. Groups performing tasks requiring cooperation will show the highest correlation between personality measures and performance .
5. R. Heslin (1964) .

general evaluation of research available [1] . the assessment of O'Brien and Owens [2] that :

> " ... the abilities of group members are generally related in a positive manner . Correlations between measures of task-relavant abilities and group productivity are typically small however. "

is confirmed by McGrath and Altman findings of no or only a slight relationship between general abilites and group task performance [3] . Even in a research project which has used a manual dexterity task [4] - with a highly validated measure of individual dexterity - could less than half the variance in dexterity scores of 65 groups [5] be accounted for by considering individual differences . McGrath and Altman's analysis also indicates that : [6]

> " there have been no tests for relationships with general structural variables and only a very little with measures of members and group performance . "

While O'Brien and Owens , for example , considered ability [7] and its effect on the performance of groups through the intermediary of structure - this structure used by groups was controlled by the researchers . Results were supportive of the need for a particular group structure for the development of statistically significant correlations between group productivity and and summary measures of group abilities [8] . However some recent comprehensive studies have found that the performance of groups could not be attributed to identified

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1. Reported in G.E. O'Brien and A.G. Owens (1969) .
2. op cit page 525 .
3. op cit section on " General Abilities " pages 110 - 112 .
4. A.L. Comrey (1953)
5. Groups composed of only 2 members .
6. op cit page 211 .
7. A military service entrance test .
8. op cit see especialy correlation table 2 page 529 .

differences in general abilities [1] .

Biographic Characteristics

In considering the question of the biographic description of individuals and the use of biographic scores in investigations there is specifc problem . The groups which have been employed in research projects , even when no matching of populations within groups used has been attempted , have been obtained from populations with a narrow and often non-organisational relevant range of implicit biographic characteristics [2] . This is a criticism which applies to much group research , particular to attempts to generalise from the results of a single study undertaken with such group populations . It is possible to use the narrow range of biographic (and other membership characteristics) variables implicit in the sources of group membership to experimental advantage . Fiedler has carried out the same study with groups which had a different organisational source (university and military recruits) and different nationality and religious affliation [3] . The growth in the use of business organisations as a supplier of populations for small group studies [4] has assisted the extension of the use of biographic characteristics like age , level of educational achievement [5] . McGrath and Altman [6] identified that biographic characteristics had been used in 32 of their large sample of group research . However they found that biographic measures were either not or only slightly related to the actual task performance of groups .[7]

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1. See J. Crawford (1967) and S.D. Deep et alia (1967)
2. Typically , university students , military servicemen and children who are members of an organisation .
3. See F.Fiedler (1966) .
4. Caused by managements growing interest in business exercises and group methods of interactive skill development .
5. See J. Crawford op cit
6. op cit pages 1o6 - 1o7 .
7. For example , Friedlander op cit (page 263) found that the mean group age and group age range were correlated by a measure of effectiveness (produced from factor analysis) with coefficients of only 0.07 and 0.27 , respectively .

Biographic Characteristics relating to Organisational Membership .

This membership information is only of importance for groups which are part of an organisation proper - or for groups which are composed of members who who are drawn from either a single organisation or organisations where variables in this category can have the same meaning . As these two areas of study have been amongst the least attempted there is little in the literature . The distinction made between this category of biographic characteristics and the general biographic variables of group membership has , as a consequence , not often been introduced . Yet in studies concerned with real groups in organisations this data , besides being the most easily available , [1] is likely to be a higher predictor of success than general biographic data [2] . Research which has included such measures [3] has up to now been carried out with only a single organisation . However , many of the measures used [4] suggest that , with a little tighter treatment of data , inter-group comparisons between different organisations may be possible . The few results available indicate a promising correlation between the means and ranges of scores found in work groups with both the performance of the group and some measures of the groups' structure .[5]

---

1. Almost all organisations keep some summary data about employees and the range of information develops (for example statuatory requirements in the U.K. relating to the Industrial Training Act) . The increasing use of computer storage with recall and statistical summaries is making this material more available to the organisation researcher .
2. The average length of service in many organisations is more than 10 years .
3. See J.Crawford and F.Friedlander op cit .
4. Length of employment in that organisation . Organisational level .
5. Friedlander op cit obtained a correlation coefficient of 0.80 (page 263) between the mean occupational level of the group and the effectiveness rating of that group .

Group Structure

In no other conceptual area in studies involving groups and groups in organisations has there been more confusion about what is implied by the idea of the structure of groups . Many authors have avoided using the word structure in the context of the small group . Schein , in his analysis [1] , is prepared to talk about the " structural " characteristics of organisations while he prefers the term " dynamic " for almost analogous concepts associated with groups . Definitions of group structure have been as restrictive as to include only the formal imposed hierarchy of status (or responsibility or as general as to cover all attitudes and opinions held by members of the group which has perceived relevance to the group situation . In some instances the overt behaviours and activities of group members have been included under the structure head In the following review of some relevant research findings included in this section a distinction is introduced , and maintained throughout this thesis , between so-called first and second - order structure measures . It is suggested that one of the most important reasons for the lack of applicability of most group studies has been a concern with the measurement of variables which are under the second - order heading . In this research instruments have been primarily designed with reference to the proposed model of group functioning and its emphasis on first - order structural measurement . Second - order variables have been measured during the study but these results provide general knowledge about organisational groups and their members outside the limits of the core model of group functioning with respect to directed tasks .

First - order measures of structure

The distinction which has been used between first and second order structural measures has resemblance to the formal / informal dichotomy of structure which has been a reoccuring feature of organisation theories . The concept of formal / informal has also been considered at the level of groups in organisations [2] .

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1. E.H. Schein (1965) page 74 .

2. See , for example , J.A. Litterer (1965) page 136 .

" Formal organisations ... are looked upon as including the planned portions of the organisation but also those behaviours of individuals and groups influenced by these organisational prescriptions . "

The distinction between formal and informal structure appears to be whether it is prescribed or whether it just develops . However , a number of authors have raised the interchange which can occur between the two - especialy the " formalisation of informal structure [1] .

" Formal organisations [2] can arise imperceptibly and gradually from informal organisation . "

The definition of first - order structure differs from the traditional formal structure in that many of the structural characteristics contained within the description can be <u>self determined by the members of the group</u> . While the formal structure would include both the size and hierarchic responsibility inthe group it would explicit <u>exclude the task and decision structure</u> within the group . These two later structures are , at least , significantly effected by the group members <u>even</u> if the cumulative task and responsibility required of the group <u>is</u> specified by the organisation .

<u>First - order structural features of a group are the important characteristics of the group which are a response to deal with set tasks or tasks developedby the group</u> . Excluded from this definition are the activities and behaviours of group members or the group which are also task related . The important notions within this concepts of structure developed as a response to deal with tasks must include :

a. Pattern of distribution of sub-tasks / actual differentiation of sub-tasks

b. Pattern of distribution of responsibility with respect to total task or series of sub-tasks .

But measures of <u>task</u> and <u>decision-making</u> structure have been little used in group studies even though these two structures have the most relevance in any task - directed organisation.

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1. J. Woodward op cit page 74 - 75 .
2. Woodward is again using the term " organisation " as a synonym for structure .

Once again the type of tasks which has been used by small group researchers has been a cause of the absence of studies where " first - order " measures have not been obtained . Golembiewski , in his review [1] , raises a point which has been important for many researchers :

> " ... a task may have properties so compelling that it encourages short - run behaviour inconsistent with the socio - emotional needs of members . "

Their thesis , summarised by Golembiewski , is that the tasks used in group research should be capable of providing for the socio - emotional needs of the members of groups participating in research . Therefore the associated group structures related to task accomplishment should be similarly conducive for groups . If group research is to have real applicability to organisations the fact that the great majority of organisations have the satisfaction of the needs of their members as only a minor [2] organisational must be recognised . The tasks required of groups should be designed to mirror the dominance of economic over social organisational objectives .

Group size has been the commonest reported first - order attribute of both groups within and outside organisations . This is because it is the only variable which has been recognised as an independent variable . There are no studies where the group completing tasks have been allowed to decide optimum size and act upon their decision [3] . The nearest approach to this situation was in a study reported by Guetzkow and Bowes [4] . They designed and used a task which they assumed would differentiate (perhaps conciously) members of a group into a structure of two stable sub-groups . The group failed to form the predicted smaller groups in response to the task . Most research interest in group size has centred about the production of criteria for the " best " size of

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1. op cit
2. Even if currently popular and subject to legislation .
3. This is , of course , true of most organisational groups .
4. 1957 , pages 394 - 396 .

groups for dealing with tasks . Another series of studies has considered the " maximum " number in a group before structural change (like the formation of sub-group structure) can be detected . But a number of studies have discounted the importance of the size of groups as being the single determiner of group behaviour and performance . Kelley and Thibaut [1] consider that size of groups is not a specifically critical factor because changes in group size affect too many group functions to enable the prediction of influences on individual variables . A further analysis confirms this opinion [2] :

> " ... what appears to be important here is complexity which is often indicated by size but which is quite distinct from it . "

Complexity of structure has , itself , been used a group structure concept [3] :

> " Structural complexity has three components :
>
> a. Descrimination - the extent to which detail is articulated .
>
> b. Differentiation - the number of independent concepts an individual uses in organising his perceptions .
>
> c. Integration - degree and mode of inter - relatedness among concepts .

But the actual operational use of these components does seem difficult .

A review of the effects of group size [4] in the groups used in laboratory situations recognises that size has been an independent variable but puts some doubt on some research results because the corresponding variance in task and membership characteristics which have not be considered at the same time .

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1. 1954 page 761 .
2. Zelditch and Hopkins (1961) page 470 .
3. C. Castore and S. Streufert (1967) page 12 especially.
4. E.J. Thomas and C.F. Fink (1963) page 378 .

The patterns of authority within a group [1] have , in most research , just been left to develop within the group without researchers' specification of a structure . The description of an authority structure has been made in terms corresponding to the basic sociometric method - even if this has not been recognised by the designers of the measurement . In a theory which did acknowledge this close correspondence , an attempt was made to extend the sociometric description of a small group to cover a total large organisation [2] . The traditional method of describing organisations by the use of charts in which structural relationship is indicated by the use of " linkage " and " levels " is of little use . This is because the relationships implied by the graphical method are nearly always unstated or expressed in such terms which makes for continued confusion . Even within one organisation the implicit meaning of structure expressed through the organisation chart may have different precise meaning in different parts of the organisation . Where it has been possible to apply graph theory to the linkages indicating relationships within groups [3] , where the meaning of linkages can be clarrified , the analogous exercise with total organisations has not been attempted . Starbuck's comments made in a section headed " Surrogate variables and non - operational terminology " - where the social scientist's non-operational concepts are identified as a major reason for the lack of success of mathematic applications in organisations - could be extended to include the designers of organisations and organisation charts [4] . The ambiguities of the organisation - recognised authority structure has lead the organisation theorist to devise more operational concepts when he has been able to conduct organisational experiments .

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1. Defined as : who can decide the actions of the group with respect to the actions (physical or the making of decisions) needed to accomplish the task(s) . Variously listed as the administrative structure , authority levels and status levels within the group .
2. R.S. Weiss and E. Jacobsen (1955) pages 661 - 662 .
3. See , as an example of graph theory used to facilitate the structural description of groups , C. Flament (1963) .
4. W.H. Starbuck (1965) pages 344 - 345 .

Models of organisation hierachy systems [1] have not assisted the development of a comprehensive and consistent theory of group / organisation structure variables. Structure measured in simulations of groups and organisations has , on a few occasions , been directly comparable with the organisation status / task structure which is implicit in the organisation chart . Apart from those few studies where a total organisation has been duplicated solely for the purposes of research [2] a whole series of research studies were associated with groups containing three levels of authority and task status taking part in a business exercise [3] . A simple authority structure has also been present in many uses of the " primary " group at the production interface - due to the inclusion in the study of the " linking pin " [4] , namely the supervisor or foreman [5] .

In this current research framework , this concept of authority - one person being directly responsible to another - has not been used . This is because of the differences in the real meaning of such a " responsibility " and the difficulty in measuring these differences . However the concept of authority in relation to the tasks required of the group does have a directly measureable principle component . This is the " distribution " of real decision - making amongst the actual members of the group with regard to the whole series of sub-tasks which the group has to perform . The majority of groups have a distinct set of sub-tasks and the pattern of who can take decisions on these individual sub-tasks is unlikely to conform , at least in part , to the organisational recognised authority hierarchy . It is suggested that this method of measuring " authority " for each measureable sub -task required of a group is not only a more available , but is also a more realistic and genuine characterisation of the authority structure .

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1. W.Evan (1965) , for example , proposed that organisations have three kinds of hierarchy : Skills , Rewards and Authority .
2. RAND studies for example . R.L. Chapman et alia (1959)
3. With the Carnegie Tech. Managment Exercise . See R.J. Cohen and E. Rhenman (1961) .
4. In Likert's (1958) terminology .
5. T.M.Lodahl and L.W. Porter op cit page 73 represents an example .

The tasks carried out by groups has been the subject of some research - but the differentiation of group tasks into sub-tasks , and the " distribution " of these sub-tasks over the members of the group have not been studied . Yet these phenomena of sub-division and the concern of different group members with different sub-tasks are commonly reported . For example [1] :

> " The tendancy to break down tasks into segments or subtask in order to maximally employ the time , energies , and talents of group members seems an ubiquitous feature of group performance . "

Some research has used two tasks associated with groups . One task was capable of sub-division - the other was not able to be divided into component sub-tasks [2] . These tasks were designated " collaborative " and " coordination " tasks . The researchers in an introduction say [3] :

> " The organisation used in most studies of small group performance is a collaborative one where group members are expected to cooperate with each other at all stages of the task activity ...
>
> Little is known about the relationship been the abilities and group productivity in situations where the group is required to cooperate through task coordination rather than through collaboration . Coordination occurs when different tasks are alloted to different positions and the tasks are then ordered by a definite precedence relationship . "

It is this second type of task distribution which is found in most organisational groups . In fact the idea of " specialisation through task " has been included in some definitions of organisations . Naylor and Dickinson , for instance , described a relevant " work structure " variable [4] :

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1. Roby (1962) page 263 - quoted by Weick (1965) page 222 .
2. G.E. O'Brien and A.G. Owens op cit .
3. Page 73 .
4. J.C. Naylor and T.L. Dickinson (1969) page 167 .

" It involves

(a) definition of the operations to be performed .

(b) the sequence in which these operations must occur .

and (c) the way in which interaction must occur . "

The use of such tasks in small group research was delayed until complex business exercises were developed for training purposes [1]. However the majority of research involving the use of business exercises has not identified structure variables [2] probably because the total task required in the exercise requires " collaboration " rather than " coordination " . In an exercise that requires decisions to be made , all group members take part in all decisions . However in some exercises [3] there is a degree of complexity in the functional areas included in the simulation which may require that each group member does carry out a specific task role which contributes to total group decision - making . Hesseling and co - workers have over many years used an exercise of considerably less complexity than most computer-based exercises . This exercise has been fully described [4] . Unlike most business exercises there is an absolute best result against which the performance of individual groups can be judged [5]. The researchers give the following reason for their use of simulations in research and training [6] :

> " Because the real life situations within large organisations are too complicated to analyse directly and completely , one approach (and the approach used by Hesseling) could be to simplify these situations to such a degree that

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1. Most activity in developing business exercise was in the period 1957 / 1967 , that is post Andlinger (1957) .
2. See Greenlaw et alia (1963) .
3. For example exercise BTA developed in BEA after 1963 .
4. P.Hesseling (1964) and (1966) pages 252 - 282 and pages 329 - 350. P.Hesseling and E.Können (1969) .
5. In most exercises there is random and competitive factor .
6. P. Hesseling and E. Können (1969) page 31 .

realistic relations between departments could be combined with a measurement of performance and communication patterns . "

and continue :

" ... The degree of abstraction that the classic laboratory experiments (e.g. Bavelas) show is , however , too high for practical relevance . "

These " classic experiments " - concerned with the performance of comunication networks [1] have been a great source of confusion . Naylor and Dickinson [2] are more explicit in than analysis than Hesseling :

" The communication structure dimension differs from the work and task structure in one very important way - communication structure is viewed as being a dependent variable rather than an independent variable. . . . given any particular combinations of work and task structure , team members will develop (within the limits of that particular unique situation) a particular unique communication structure . "

Naylor and Dickinson fail to mention that all research in communication structure with teams , with a very few exceptions[3] treats communication structure as an <u>independent</u> variable . This treatment of communication structure is not relevant to the model of group functioning proposed in this research and is perhaps , not capable of producing results which have relevance for organisational groups . Indeed ,the proposition,that the topological relationship imposed on group members in a communication network is a simulation of real groups , must be considered falacious . Certain constraints exist within both total organisations and groups which do have an influence on facilitating communication - but the strict topological determination of communication by a network , as is present in these simulations , do not exist in organisations . There are

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1. See R.L. Burgess (1969) for a recent summary of this work . Table 1 is especialy useful .
2. op cit
3. Apart from the Naylor and Dickinson research op cit see R.C. Williges et alia (1966) .

some concessions in the literature that simple networks are not to be found in real organisations :

> " The ' networks ' involved in communication in organisations are not simple . " [1]
>
> " a number of networks superimposed . " [2]

One ,therefore, cannot be surprised by the results of a survey of the literature [3] , namely , that there is no simple answer as to the effect of the structure (in communication network terms) and the effectiveness of a group . This same result has been reached by Faucheux and Mackenzie [4] :

> " ... the communication network does no more tha manipulate the organisational constraints on the group attempting to solve a given problem . The organistional structure per se is neither manipulated nor controlled adequately , since in the all-channel many organisation structures can develop ... One way to othercome these difficulties is to treat the organisations (author meaning structure) as a dependent variable . "

It is suggested that the " communication " structure research framework represents an unsatisfactory compromise between topology and individual behaviour and that these components are best separately considered . In the model used in this research , therefore , the pattern as well as the content of communication is included as part of the activity taking place within the group and not as part of the concept of structure . Topological constraints on interaction , other than those implicit and measured with respect to the nature and pattern of tasks adopted by group members , is not part of the model tested in this research . However , topological considerations may have a measureable influence in certain circumstances [5] .

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1. H. Guetzkow (1965) page 542 .
2. C. Cherry (1957) quoted by H. Guetkow op cit .
3. M. Glanzer and R. Glaser (1961)
4. 1966 page 362 .
5. And were found in this research .

The amount of space given to studies of decision - making in small groups [1] in a thorough review of organisational decision - making indicates the little use that organisation theorists have been able to make of a considerable number of research projects where the main task has been to come to decisions [2] . There are many reasons why a specific group member may be invested with authority . It may be due to some imposition from the researcher , through implicit status in various alloted tasks or in the imposed communication network [3]. This later collection and confusion of the concepts of topological centrality and centralisation of decision - making [4] was first pointed out by Mulder [5] :

> " In task performing groups there is exchange of information items . But besides that , several decisions by individual members have to be made ... We introduce the construct ' decision structure ' as referring to ' who makes decisions for whom '...

However there are difficulties about the operationality of the particularly structure index he developed . Hesseling [6] , although considering this index , used a further centrality measure related to interaction . Tuckman [7] tried to relate the structure of three membered groups to the decision mechanism [8] used by the group and attempted to find evidence of a correlatio between the two [9] .A few studies have used business exercise wit different roles required of group members with implicit differences in the importance of the decisions required of that

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1. J. Feldman and H.E. Kanter (1965) . Only four sentences cover the research carried out in small groups .
2. See , for example , A.P. Haire (1962)
3. The use of a member placed topologically central will encourage speedy accomplishment of tasks .
4. Hence implying a distribution of decision - making amongst group members .
5. M. Mulder (1963) - see H.A.Hutte (1965) for a more recent example of a decision / centrality index .
6. P. Hesseling and E. Können op cit page 33 .
7. 1964 op cit page 473 - figure 1 .
8. Decision mechanisms were categorised under 4 types .
9. page 482 - 483 .

role . Fleming [1] reports the use of a post exercise questionnaire to obtain information about the system adopted by the group to carry out the majority of decisions required in the business exercise . Additionally , Haseley [2] noted that the processes used by managers taking part in a complex business exercise showed a close resemblance to the components in the March - Cyert behavioural model [3] .

It is possible to summarise this lengthy section on the structural characteristics developed by groups in response to the requirements of the tasks with the following comment . There have been no studies which have distinguished the size , the task structure , and the decision structure as the important structure concepts - and very little research which has allowed either the task or decision structure to remain as a dependent variable .

In the framework of research described in sections three and four an attempt has been made to obtain some measures of variables within these three first order measures of group structure . Only in the first series of studies (described in section three) was it possible to conduct research which meaningfully included the notion of group size and was possible to test for significant relationships with other variables . In both series of studies was it possible to measure the characteristics of task allocation within a group and the distribution of decision - making with respect to this task distribution .

Second - order measures of group Structure

In the present definition of structure measures of groups which are not in the first - order group structure are many numerous and diverse sets of concepts . Included , for instance , are all opinions and sentiments [4] expressed by the group in response to all questionnaires and tests administered by

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1. J.E. Fleming (1969)
2. 1966 .
3. See summary in Cyert and March op cit .
4. Using Homans (1950) model .

researchers about attitudes to other members of the group , the alloted task , etc. The use of these sorts of measures in this research represents an attempt to discover whether scores on these measures do relate to groups activity , structure membership , and performance variables . However their use is more illustrative than part of an extension to the proposed simple model of group functioning . Specific measures used in this study were determined by such considerations as the amount of space remaining on questionnaires and not to cover the areas which might have been thought of special theory importance . As none of the variables obtained were designed in relation to the membership , structure , activity and success model they are introduced only in the report and description sections of this thesis .

Group Activity

This research recognises that there are three possible foci for an examination of the purposive activity of a group which been set (or which has developed) a task or series of tasks . These three categories , which are not mutually exclusive , are :

a. The total activity of specific individuals within the group .

b. Overt behaviour of specific individuals within the group directed towards other members of the group .

and c. Patterns of either activity or behaviour for the whole group .

As has occured with other attributes of groups the use of different tasks in group research has resulted in highly specialist and non-cumulative theory and research . There has been a parallel developing and further refining of specific research methods and measuring devices . Research into both groups and organisations has often been characterised by the specific method used to obtain data about , for example ,

group members and managers' activities . Two examples of very different types are the diary studies of managers [1] and the Interaction Process [2] used with small groups . The first is an attempt , without much consideration of statistical significance , to measure the total " management " activity of a manager or a management group . The second type of study , associated with a special concern for the validity of methods and obtained data , has been concerned with the inter - person verbal behaviour in groups .

Those who have merely attempted to measure the overt behaviour of individuals [3] have suggested that it is only this aspect of an individuals total activity which can be measured with a degree of precision . There is certainly support for the apparent inaccuracy of some diary methods used with management groups . Burns [4] , for instance , found that in records for two managers , one the subordinate of the other , considerable anomolies were present . Of all interaction between these two managers there was a total of 165 which were recorded by the boss as being ' instructions ' . Only 85 of these interactions were similarly registered by the second manager . This result is cfconsiderable organisation theory interest but it is impossible to locate the source of the difference in diary records . Differences might be due to real perceptual differences of the two managers or may only be due to different interpretation of categories used in the activity characterisation scheme . The general problem of ambiguous categories in manager diary recording has received attention [5] but there is another recently raised criticism [6] :

> " The use of a simplified diary schedule of this kind means that the amount of information contained in each is extremely limited : it amounts (in Burn's example) to a description of one's

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1. Developments from S. Carlson (1961) and T. Burns (1954) studies . See W.A. Amphlett Lewis (1966) pages 49 - 52 for a review .
2. Originating with R.F. Bales (1951)
3. Most usually only verbal behaviour .
4. op cit page 95
5. See D.L. Marples (1967) .
6. H. Mintzberg (1970) .

behaviour in a language of less than fifty verbs and nouns . "

However , the corresponding models used in observer categorisation of behaviour [1] require similar simplicity if the research involves more than a single observer because of reliability problems[2]. The issue of which instruments are to be used for measuring " activity " does not depend on the reliability of existing methods - as methods associated with both total activity and overt behaviour only have implicit problems in operation . More important questions which should effect the choice of what characteristics of activity are measured are task and decision demands made upon members of organisations . Particularly important is the actual percentage of time which organisation and group members are actually engaged in interaction with others compared with total task [3] directed activity . Secondary questions are whether , perhaps , even if inter-personal contact is a high percentage of total task directed activity , this interaction is either representative or even important in the the determination of the success achieved by individuals and the groups to which they belong . Current systems of job analysis and description used by organisations have suggested that the skills of inter-personal contact are not important . Some evidence exists [4] that the method of critical incident job evaluation [5] shows a reverse result : the interactive activity is a most important determiner of managerial success . It is also not possible to make a decision about how typical the content of inter-personal behaviour is compared with total activity because there is no body of knowledge of about the structure of managerial activity and behaviour . The following comments were made in a recent study [6]:

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1. Most research has used Bales original categories - or a reduced total based on either low incidence or identified high cross - correlation .
2. See comments on scoring and reliability of behaviour recording - both neglected areas - in N.E.Waxler & E.C.Mishler 196[illegible]
3. Carlson , op cit , was the first to emphasise the lack of a " body of knowledge of normality in the statistical sense "
4. See discussion in M.J. Colbert et alia (1971) .
5. Critical incident method is based on recall of episodes which appeared decisive in determining success or failure of a manager's contribution to the organisation .
6. A.W. Palmer and R.J. Beishon (1970) page 36 .

" Very little information about managers actually do is generally available . A few studies have been done but as Sayles points out [1]:

' '... the sum of such research is a very modest one. '

Assembly workers and machine tenders have been more popular subjects for enquiry than managers . "

Even data about the proportion of time spent on actual interaction as a total of total managerial activity is limited . The few results suggest that the percentage spent on non-interaction [2] is significant and that the tasks used in groups which attempt to simulate organisational simulation are too interaction stimulating .

Research has , as a consequence , been of two distinct and unrelatable types . The first has used business management and communication theory [3] as the source for the category system . The other type has used groups where the socio - emotional needs and behaviours have been , it is suggested , overemphasised for relevance to real organisation behaviour related to task accomplishment . This second result is been confirmed in a number of separate uses of the Bales scheme in real organisations . The common conclusion , from training groups carrying out a business exercise [4] , from a group selection using structured tasks [5] , and from real work group studies [6] is the

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1. L.B. Sayles (1964) .
2. Palmer and Beishon op cit found that a senior personnel manager - a role expected to be highly interactive - spent 48 % of his time not interacting (see page 37) . Carlson had earlier produced a figure of approximately 30 % of the time of senior managers spent in non-interaction
3. For instance , Fayol's management categories of Planning , Organising , Coordinating , and Controlling have been used in many studies . See J.H. Horne and T. Lupton (1965) . The mode of communication has been examined , amongst others by Palmer and Beishon op cit page 38 (distinction between face - to-face , telephone , and written communication) .
4. Bales method was used at an early stage in the ATT ITB interactive skills studies . See N. Rackman (1971) .
5. In Rolls-Royce selection department . The original categories were reduced in length . K. Hardman (1969) .
6. N. Rackham (1973) and S.B. Tribe (1973) .

comparitively low frequency of socio - emotional behaviours in comparison with the results obtained by those working with typical small groups .

Organisation theorists have avoided the concept of the organisation members'activity or behaviour in total models of groups and organisations . D.S. Pugh , in a review article entitled " Organisational Behaviour : and approach from Psychology " [1] describes his own programme of research as :

> " ... a long term , far flung , programme of work which aims to inter-relate systematically on a comparitive multivariate basis the context , structure functioning , and performance of organisations and the attitudes , behaviours and performance of groups and individuals within them . "

However , in describing current research he continues :

> " Present studies are concerned with ... and , a study of the attitudes , interaction patterns and ' psychological climate ' of managerial groupings in particular organisational sub - units . "

This apparent movement from the consideration of the behaviour or individuals to an interest in " interaction patterns " is something of a contradiction to Pugh's description of the main conceptual task facing Organisation Theory :

> " The attempt to inter-relate data at different levels of analysis - the individual , group , organisation and environment . "

In the research scheme contained in this thesis measurement of total activity rather than specific concern with interaction has been proposed and carried out . As the research is designed to effect a synthesis of the concepts of the group with respect to task completion the activity associated with groups has been studied at both the individual and group level [2] . The scheme of characterising the purpose of activity , both overt and covert , is based on the notion of organisation members as decision makers . These decisions are required of organisation

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1. 1970 . All quotations are from 351 .
2. Implying ' patterns ' of interaction between group members .

members [1] to obtain organisational objectives and are part of the tasks necessary to achieve results . Decision - making has been employed as a central group functioning concept but it has not been used as a method of identifying and characterising the activity of individuals and groups . There is support for this view of decision - making related to task directed activity [2] :

> " There can be no concern more directly relevant to the student of organisational behaviour than how men deal with their environment through problem solving in purposive settings . "

Bales studies with groups have been noted [3] as important applications of the concept of decision - making activity in groups . In the original paradigm of behaviour [4] were included problems of evaluation , of control and of decision . But the most essential components of the Bales scheme is the series of distinctions made between task and social - emotional behaviour,and between positive and negative pairs of behaviour . The model of decision - making and control activity adopted in this research is based upon current knowledge about the characteristics of human decision - making under uncertainty [5] . This model , shown on the next page , represents a combination of the usually separately formed descriptions of decision - making [6] and control [7] activity in organisations . The usual model of decision - making has been extended to cover the important concepts of implementation and maintenance of decisions using the concepts of control theory . Litterer [8] has made a similar integration between control and decision - making , but without trying to specify the separate detailed

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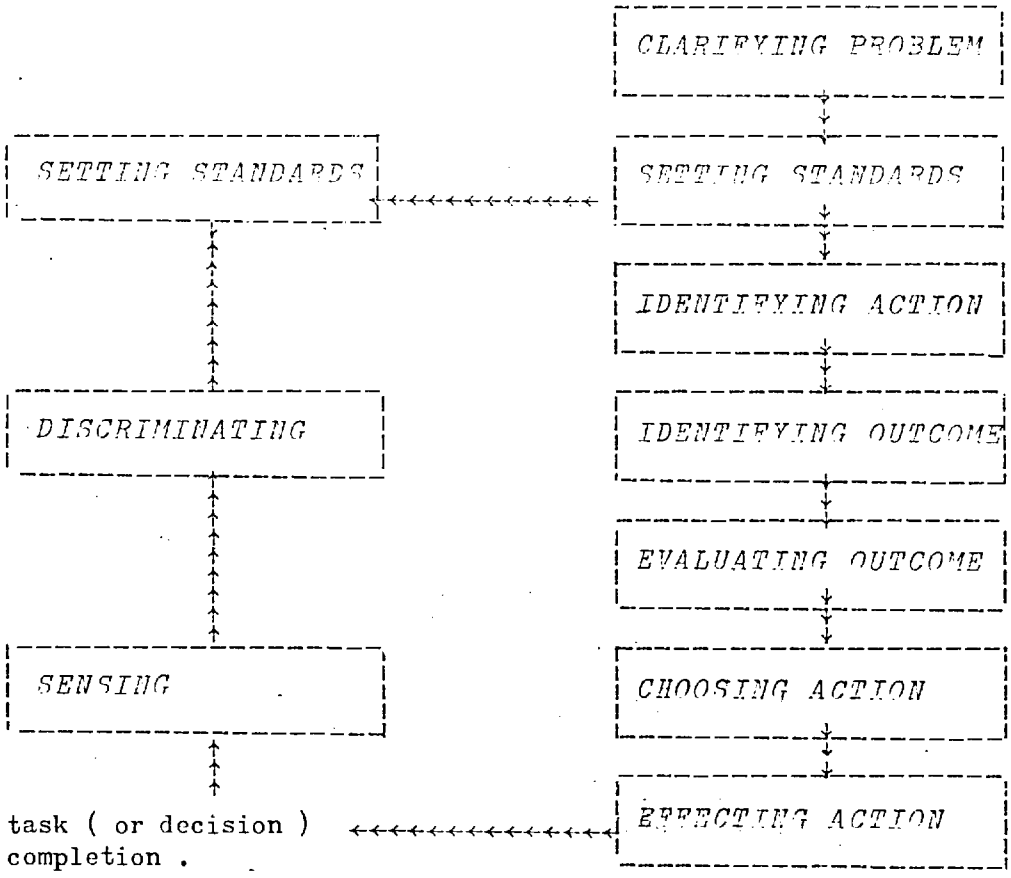
1. Most often managers .
2. A. Zaleznik (1965) page 600 .
3. J. Feldman and H.E. Kanter op cit page 643 .
4. R.F. Bales op cit page 59 .
5. See , for a wide description of this research and theory , H. Quastler (1958) and W. Edwards (1962) .
6. See J. March and H.A. Simon (1957)
7. Specially clear examples are those of S. Beer (1959) and J. Forrester (1961) .
8. J.A. Litterer (1965) Chapter 13 - particularly pages 235 - 238 . Litterer's model is included as appendix 2.3 .

ILLUSTRATION OF THE MODEL OF DECISION-MAKING AND CONTROL ACTIVITY USED IN THE RESEARCH



There are ten categories of decision-making and control activities in the model . The lines drawn between the identified categories indicate the sequence of chronological activities in rational decsion-making and control . For example , evaluating outcome will be preceded by both the indentification of outcome and the identification of action . In decision -making with respect to a particular task topic it is not essential that all categories are " used " . The identification of an action , for instance , might , at the same time , imply an identification of outcome .

parts of the model of decision - making . Definitions of the categories of activities used in this research are given in a document which was part of the study described in section four [1] .

A decision was reached at an early stage in the research that , with the resources available [2] , it would not be possible to conduct an integrated research study which would involve the characterisation of single units of behaviour or activity . The concept of an " episode " , defined by either the topic or the particular " mix " of participants , was developed . This concept of unit corresponds to the type of unit entry which has been made in diary studies - but which is quite different from the categorisation unit length of the behaviour analysis school [3] . The system of categorisation activity by reference to its decision - making and control purpose , does , in fact , require that the " quantity " of activity observed before a decision can be made as to the relevant category is considerably more than , for example , necessary for Bales method . While this system of recording episodes rather than individual behaviours does represent a reduction in the " resolution " of activity description in groups , it is acceptible because model of activity categorisation's relevance to substantive theory in task - directed groups .

The description of individual activity in groups which has been put forward in this section differs from previous use of the concepts of behaviour and activity . There is , therefore , little research of real relevance to the present studies in the general head of activity in groups . This is true of studies which have considered individual behaviour , managerial activity , or the patterns of interaction amongst group members . McGrath and Altman [4] summarise research to date by suggesting that there has been general lack of interest in relating

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1. See appendix 12.4 .
2. Assessed in terms of the field research environments and the number of people who could be involved in behavioural data collection (i.e. only the author) .
3. While the behaviour analysis school have developed a number of different systems and hence average " duration " of behaviour , a behaviour unit of one to three sentences is common .
4. Op cit pages 153 - 156 .

either the content or pattern of interaction with other group measures . The few results available [1] suggest that the content of interaction is " somewhat " related to both structural properties of the group and task performance . But that there is only a slight relationship apparent between the patterns of interaction [2] and structural properties of groups . Of especial interest is the finding that have been no tests for relationships between patterns of interaction with various task performance measures or with member properties :

" such as personality and biographic characteristics "

These two relationships represent a very considerable part of the model proposed of group concepts and functioning . The examination of these pairs of relationships has also been absent in studies of managers and managerial groups in real organisations[3]. In cases were interaction between managers has been measured this has either been carried on as an isolated exercise or patterns of measured interaction have been compared with descriptive accounts of organisational structure , characteristics of employees , or organisational success [4] .

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1. McGrath and Altman loc cit .
2. Defined as : a. Number of particular communications by a member of the group .
   b. Length of time spent communicating .
   c. Numbers of members actually communicating .
3. Since the McGrath and Altman study there has been a single study by P. Hesseling and E. Können which measured one facet of group interaction , the degree of centrality of communication . This differed for the four population sources of the groups used in the research .
4. See T.Burns (1954) and Horne and Lupton (1965) as examples .

Part Three : The research Methodology and Methods used in the B E A Studies .

This final part of the first section of this thesis explains the development of the research methodology used in the series of studies carried out within B E A and the particularly methods employed to obtain data . Characterisation of both the basic methodology and detailed methods employed is made with reference to other schemes of research and information collection in the fields of organisation and group studies . A further section considers the total sequence of the research studies in B E A - identifying the chronology of the research - together with the development of the model of group functioning and the associated research design and methods .

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Methodologies of Organisational Research

Probably the most frequent ommision by researchers when research in organisations is written up is the absence of both a description of their own research strategy and its similaritie or differences to other actual or possible schemes . When comparisons are made with other studies , usually precipitated by a concept which is common to both study , the terms of the comparison is usually only actual research results or what characteristic was measured [1] . References to the use of a particular method are more popular than a depth examination of the total framework of a research design [2] .

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1. An important recent example of where comparison was made in terms of both methodology and methods is the research reported by D. S. Pugh et alia (see D. Hickson et alia 1969) . Although methodologically very different from the Woodward study (op cit 1958) which preceded and stimulated the Aston group it was possible to obtain some valid comparisons of results . The Aston team actually reworked some of the original South East Essex data to facilitate comparison of like measures and data .
2. In review articles as well as research reports .

There are many possible explanations for this situation apart from the desire to avoid analyses which may lead to epistemological debate . The genuine lack of knowledge and experience of diverse methodological approaches - reinforced by the distinct methodologies associated with organisation theorists'and researchers' original discipline [1] - must be assessed as the prime reason . The absence of regard of one school of organisation theory for other schools is illustrative of these problems of compatibility of theory , research designs , and research results . This attitude to other " schools of thought " has been put more bluntly [2] :

> " The impression of confusion (in the management / organisation theory) arises not only because of the different disciplines which have become involved in the subject , but also because inside each discipline each researcher seems to have his own individual approach , and unfortunately he often finds it necessary to denigrate the work of others in its support . "

But although the reasons for the lack of methodological debate are unimportant for this thesis , the identification of some general trends in the methodology of research on organisations and the characterisation of this research within these trends is necessary[3]. The treatment of methodology and methods is not an attempt to be exhaustive but more illustrative with reference to the actual design used in the research carried out in B E A .

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1. This is , perhaps , most obvious in the sociology / psychology dichotomy - especialy between descriptive based sociology and measurement based psychology . However there are some schools of organisation theory where a highly specialised methdology has developed somewhat independent of basic disciplines . For example , Michigan Center for Applied Social Research .
2. J. Woodward (1965) page 249 .
3. It is particularly relevant in this thesis which uses a model of organisations in which the group is the unit which is examined . These have been the concern of different " schools " of research .

Although we accept Kaplan's [1] distinction between methodology and methods - it is nethertheless impossible to examine methodologieswithout some reference to specific methods . The detailed description of the particular methods used in this study carried out in B E A is postponed to later sections. Problems concerned with the actual use of various methods employed in this research are raised in the relevant report chapters of the thesis in sections two , three ,and four .

There are difficulties in the area of the characterisation of research designs in organisation theory -- even with the substantive meaning of commonly used words like , experimentation , field and laboratory , descriptive and empirical . This is extended to statistical technique dominated methodologies , where multivariate analysis , cluster and (especially) factor analysis [2] where different , unrecognised , mathematic assumptions are often made with regard to statistical treatments .

Allied with the lack of description in research reports about the strategy of research used there is little specification of the type of addition of knowledge to the theory of organisations which was either postulated or obtained in results . Stinchcombe [3] has categorised additions to organisation theory as falling into one of three classes :

" a. Specify and describe phenomena which have not been adequately identified previously .

b. Try to provide explanations for phenomena .

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1. A. Kaplan (1964) " Methodology is - the study , the description , the explanation and the justification of methods . Not the methods themselves . "
2. The general criticism which the use of statistics based methods has received misses the important point that many social scientists have selected a particular (usually available and convenient) method of , for example,factor analysis , which is highly unsuited to the characteristics of the obtained data .
3. A.L. Stinchcombe (1967) .

and c. Try to derive established empirical propositions from a more general theoretic structure to show how a single generating mechanism can produce a variety of phenomena which have hitherto been considered in isolation . "

While the exact meaning of this last category is not made clear , the development of Stinchcombe's thesis - that for each category there is a " best " research methodology - is attractive . However the absence of a concise statement of aims in reported research and the tendency to extend the coverage of a study in the data collection stage , does not facilitate the construction of a paradigm relating type of addition to knowledge to organisation theory with the available and used methodologies . Classification within organisation theory has been limited , in general , to " schools " of research [1] . There is , however , one classification of research design which has found some favour [2] :

" Three types of designs are distinguished : exploratory , descriptive and hypothesis testing . "

" The exploratory study is one in which the primary purpose is to gain familiarity with some problem or to achieve new insights which can guide future research . "

" Descriptive studies define and portray the characteristics of the object of research or determine the frequencies of various occurances and examine their inter-relations . "

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1. D.S. Pugh (1969) page 345 :

" a number of lines of development affecting the conceptualisation of the sub-discipline (organisational behaviour) . "

" These were :

a. management and administrative theorests from Fayol to Wilfred Brown .

and etc. "

2. Selltiz et alia (1959) quoted , amongst others , by W. Scott (1965) page 267 .

" Hypothesis testing studies center on the collection of data that will serve to confirm or deny a specific hypothesis or set of hypotheses . "

Scott adds :

" Of course , some studies combine more than one purpose . "

This classification of research studies is quite accepted even though - for a large number of research projects - it is only after the research is completed that the categorisation of the purpose of the study can be decided [1] . However , there are two further implications which are especialy relevant to organisation theory and the research described in this thesis .

The first complication is due to the problems found in the measurement of variables and the statistical treatment of obtained measures . Although Pugh [2] has characterised two types of research study - the"clinical - processual" and the " statistical - factorial " - few studies could now be easily classified under only one of these categories [3] . Pugh has also raised the related problem in organisation theory of whether or not research has reached a stage at which measurement is appropriate . Useful contributions have been made to organisation theory in which the only " measurement " was a categorisation of organisation structure " types " [4] . In the area of organisational groups the great majority of recent work has involved considerable amounts of measurement and the question of the relationship between what has been measured and the form of the model of groups or organisations proposed has become an important

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1. D.S. Pugh (1969) page 346 identifies the problem of " ex post facto " design and cites the cause as the " management oriented problems " of most organisation research .
2. loc cit page 346 .
3. In fact D.S. Pugh is combining the two approaches .
4. In the Burns and Stalker study (1961) the population of organisations were (apparently , ex post facto) categorised using the simple dichotomy organic / mechanistic

differentiator of research . Pugh ,and others [1] who have specialised in multivariate analysis and factor analysis , represent a new kind of empiricist , primarily concerned with the obtaining of internally valid [2] measures of organisation functioning and avoiding either the specification of models or of specific hypotheses . This desire to obtain measures which have been shown to be internally consistent may result in the following : [3]

> " ... if .. our scales of say , specialisation and centralisation do not in fact tap these characteristics than other names will have to be found for them . "

It is too early to judge whether this approach can lead to the building of successful theory about organisations - a stage beyond that proposed by Pugh [4] :

> " If we can postulate relationships between the four boxes shown [5] and obtain data to support our hypotheses , then we have gone a considerable way towards demonstrating that our scales do measure aspects of structure which are relevant to organisational functioning . "

But , as Pugh has written elsewhere [6], there remains a very important difficulty in this approach :

> " ... practioners (sic) are often unaware of these assumptions ... as the continued failure of generations of psychologists and other social scientists

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1. D.S. Pugh and D.J. Hickson (1968) page 394 - for an earlier work with substantially similar methodology see R.B. Cattell et alia (1953) .
2. See B.J. Underwood (1957) for a relevant treatment of internal validity .
3. and 4. loc cit page 364 .
5. Pugh and co-workers research paradigm is shown as appendix 2.1 .
6. D.S. Pugh (1969) page 347 .

to comprehend the difference between ' statistical significance ' and ' substantive meaningfulness ' exemplifies . "

The form of the research described in this thesis is a combination of the two approaches to measurement and model building . Variables , which have substantive meaning in a model of group functioning have been chosen for measurement in a field situation . Unlike Pugh we have not measured what is able to be measured in an organisation - which requires the use of factor analytic techniques to produce " underlying concepts " [1] . However , the treatment of data in this thesis is more readily recognisable as belonging to the field of experimental psychology . The nature of obtained data is checked before the examination of inter-relationships between variable is carried out . For , even though we are apparently measuring group artifacts which have high internal consistency, this must be confirmed at every stage in the use to which data is put in hypothesis and relationship testing .

The second consideration , of special reference to this thesis and series of studies with groups , is the problem of the degree of control exercised by the researcher over the situations which are observed . The degree of control over the situation is often summarised by the use of the

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1. Pugh et alia (1968) used diverse and original measures in the " structure and technology " areas . This research is of importance because of the actual results of the factor analysis (principal components method) produced the following four major factors :

	% of variance
Factor I "Structuring of Activities"	33.06
Factor II "Concentration of Authority"	18.47
Factor III "Line control of work"	12.96
Factor IV "Relative size"	8.20

Unlike the majority of factor analyses these results indicate basic factors with some obvious relevance to organisations i.e. it may be possible to measure them directly . The first two factors (contributing 51.53 % of total variance) have very close analogies in the concept structure which were directly measured in this research .

the words " field " and " laboratory " studies [1] but the analogy with the use of these methods in pure and applied science is too simple deal with the range of control present in tests and development of theory . McGrath and Altman , using a slightly extended interpretation of these two categories [2] , found that 10 % of the literature on small groups defied categorisation - an indication of the unsatisfactoriness of the classification scheme . But , for reasons put succinctly by Argyle [3] , the category of " laboratory experiment " is quite reasonably applied to over half the published research on small groups [4]. The proponents of laboratory experiments have not given many reasons for their selection of the method . The reason can be assumed to be due to the unavailability of " naturally occuring " groups to which access is allowed and the contrasting case of obtaining " captive " populations [5] who can participate in experiments . One feature of the classic laboratory experiment is not present in studies with groups . Variables are rarely subject to control [6] and the results of the study are based on correlational studies between dependent variables without reference to the characteristic of the group which has been specified by the research designer .

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1. See R. Christie and M. Deutsch et alia (1954) for a polemic on the difference between " field studies " and "laboratory experiments " .
2. McGrath and Altman (1966) " laboratory experiment " , " field experiment " and " natural groups in field situations " .
3. M.Argyle (1968) page 26 :

   " One of the difficulties about these statistical comparisons is that it is often not clear which is the direction of causation . In an experiment , it is obvious that the manipulated experimental variable must be the cause of any changes which occur . "
4. McGrath and Altman loc cit . 55% of small group studies are classified as laboratory experiment .
5. Especially university students .
6. Except in the area of the membership and size characteristics of groups . The " communication network " studies - see page 47 - kept control over one (even if a little complex in nature and ill-defined) aspect of group structure .

Even where one aspect of group functioning has been controlled adequately , the low number of results and the lack of theoretic propositions between variables, has made for unsatisfactory research results . This may , however , be planned by the researchers :

> " Experimental studies of simulated complex organisations are concernes with exploration and discovery as much as proof . On this point there seems to be considerable agreement . " [1]

Even a theoretician like Kaplan uses the term experimentation with an implication of meaning suggesting facilitated observation rather the " manipulation of variables " during an experiment [2] . In summarising this consideration it is necessary to accept the commentary made by Weick [3] in a substantial recent review :

> " ... laboratory experimentation tends to be a highly idiosyncratic activity ... "

The attempt by group researchers to make results of research with extra-organisation studies of groups applicable to groups which are part of a large organisation has led to a new terminology : [4]

> " By labelling their experiment a simulation , experimenters seem to be making an effort to forestall criticism that research has nothing to do with real organisations . "

One highly relevant argument which has not been used to justify the use of experimental method through the control

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1. Wagner and Palola (1964) page 418 .
2. A. Kaplan (1964)
3. K.E. Weick (1965) pages 194 - 197 and 198 - 199 .
4. K.E. Weick op cit page 200 .

(by manipulation) of variables is that real organisations do just this same activity . They control membership , define tasks and the authority structure - even if in a way which is difficult to tranpose to a research environment . In this present research scheme , most substantial theory development has been carried out in a series of non - organisational groups . In the traditional sense of the word , these simulations could not be termed experimental . The only control which has be exercised over these groups is their size and that the basic task of the group is specified . Both these characteristics are found in real groups in large organisations . In contrast to most studies with groups [1] the membership of groups under study has not been controlled according to a wish to precipitate results . Postman and Tolman's maxim [2] :

> " Patterns of ecological variables must be left undisturbed and studied as they occur in natural situations . "

has been followed at all stages of the research . This leaves the researcher with a range of techniques , primarily , analysis of variance , partial and multiple correlation [3] , for statistical manipulation of variables at the end of data collection [4]. As Weick has remarked [5] this retention of variables results in interaction among variables which can be costly [6] . Weick has further identified [7] the reason why there is an

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1. Weick op cit pages 218 - 220 .
2. L. Postman and E.C. Tolman (1959) page 521 .
3. See B.J. Winer (1962) for a relevant treatment of multivariate analysis .
4. This term was first used by C.W. Brown and E.E. Ghiselli (1955) .
5. loc cit page 205 .
6. Both in terms of the research time , resources and data processing expenses . Compare , for example , the resources used in the Woodward study (1958) with the similarly technology based work of the Aston group looking at a similarly large industrial sample (D.J. Hickson et alia (1969) page 382) .
7. loc cit page 204 .

abundance of variables :

> " Experiments with organisations are likely to be ' property rich ' and complex for some time , because there has been little clear specification of critical organisational variables .

In the model of group functioning presented in this thesis a very limited number of important variables within each of the main concepts were proposed . The methodology employed during the main use of simulation groups and the organisation group studies was acceptable only because the number of variables easily available in the membership / structure / activity concepts were few . The statistical techniques used in dealing with the collected measures of variables were various correlational methods , and , especialy , the use of analysis of variance techniques : a multivariate analysis - including all measured items - was avoided . The use of the particular methodology , outlined in subsequent sections , is a direct result of the simplicity of the model of group functioning proposed and put to test in a variety of group situations .

The Strategy and Progress of the Research in B E A

Although the model of group functioning and the basic research methodology of the studies using groups in British European Airways has been described there are two additional areas which need further expansion . These are :

a. The use of early resources in B E A to develop both the model of organisational activity - and to find out what would constitute an appropriate methodology for the main research design in order to test this model through measurement . Additionally it was necessary to find out which specific methods would be suitable to obtain required data . These preliminary studies naturally had their own strategies and methods .

b. The research relationship between the studies which used groups carrying out a simulated organisation task and the research which used actual management groups within B E A .

Preliminary Research Studies

Two distinct studies were carried out . The studies used a series of groups with managers taking part in a business exercise and a part (geographically distinct) organisation of B E A . Although the organisation study followed the study using simulated groups , both here and in section two the order has been reversed as the second study , chronologically , was less related to the final research scheme outlined in this section and described in sections three and four .

As described earlier , the research was conceived as a direct development of the Woodward and co-worker studies with , however , a closer examination of the role of control and decision-making systems at a management level in an organisation which was not classifiable in the South East Essex " technology " measure . While arrangements for the provision of facilities for the first trial organisation study were being made , the study involving the use of groups taking part in a training course which used a management decision exercise was begun . Methods tried out in the simulation study , and found successful , were not used in the preliminary organisation study . The method used in this first organisation study was a modified " tracer " system . Obtained data would be of use in testing hypotheses which related organisational decision-making and control systems to organisation structure . The study can only be evaluated as a failure . The dependence on the method of semi-structured interview to obtain data was particularly responsible for the lack of success . In addition the organisations own structural description seemed in many instances to be neither relevant for organisation members or for use in a research scheme . A specific result was that it appeared essential , if structural description was to have substantive meaning , to define structure in terms of the tasks required of sub-units of total organisations [1] .

The more extensive preliminary studies of the groups of managers taking part in a business exercise were designed in the first instance as a test of the suitability of a model

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1. That is , as presented in the model earlier in this section.

of decision-making and control activity in an environment where decision-making was taking place . The studies made by Crawford [1] , who had carried out an extensive study with this same simulation , and his limited comments on the development of organisation-like structure, prompted the researcher to examine the facility for research which the groups taking part in the simulation offered . Although the study was directed towards confirming the applicability of a model of decision-making and control activity , the observation recording method of recording this information , some other use of the data was made . The most important result of an analysis of data obtained was the confirmation that measures of aspects of structure , activity and success of the various groups could be obtained and that these measures showed considerable stability during the existence of the groups .

The form of the research which forms the bulk of this thesis and the model of group functioning of relevance for task - directed groups was drawn up after these two preliminary studies had been completed [2] . Further research was projected as having two stages . The content and objectives for these two stages were as follows : -

a. A comprehensive use of the groups taking part in the B T A Exercise [3] . To further confirm the usefulness of this particular simulation . To develop instruments to measure group variables of membership structure , activity , and success both for use with these simulated groups and for later later use with real organisational groups . To carry out an examination of the data obtained under the three concepts of group functioning and the dependent variable of the success achieved by groups . To carry out statistical tests of projected relationships between membership and structure , structure and activity , and between these and measure(s) of of group performance . To confirm the model of

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1. J.Crawford (1967) .
2. Approximately during the period September / November 1966 .
3. Carried out during the period September 1966 and April 1968 . Some data was used from groups up to February 1969 .

decision-making and control activity as being capable of producing a measure of task directed activity of individuals in the group situation .

b. A second study using real management groups concerned with organisational tasks . Although measures of performance and membership were not available (and the tasks required of groups must be assumed to vary) the real groups represent an oppportunity to test the appropriateness of the developed measures of structure and activity in real groups within an organisation . Identical methods to those used in the earlier simulation study were employed. Where new methods were introduced these are first validated against the earlier measuring instruments through parallel use . However this research was not just an attempt to confirm the usefulness , appropriateness and general validity of the scheme of research carried on in the simulation based study . It was directed towards the finding of similar or different results compared with the earlier study in the specific areas of the structure and activity of groups[1] when two additional factors are present . These two factors are the <u>different required tasks</u> of groups and group members and the <u>extra-organisation interaction</u> which is possible in real groups . Because there are not a large number of research studies which have studied organisational groups , especialy groups within the same large organisation , the range <u>and use</u> of data collected was greater than that implicit in the simple model of group functioning with important variables .

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1. It is these two concept areas which have been the most neglected in organisational research . Additionally , it is in these two areas where the measures used are most novel in the research described in this thesis .

Methods used in the studies of Groups

While the specific content of the general measuring instruments used in the research and the use to which this information is put are substantially new , the instruments themselves are well known . The following methods were used during both of the second studies : -

1. Recording of Individual and Group Activity by the researcher .

and 2. Questionnaire completion by the participants in the studies .

In addition , a further method was used in the second study - with real managerial groups . This was the self-recording by these managers of their own activities as they happened [1] . Methods used during the first investigatory studies are described in section two - where these methods were not later adopted during the main part of the research . The remainder of this section considers the two methods of observation recording[2] and diary recording in some detail .

Observation Recording

Although , as W.R. Scott has confirmed [3] :

> " There exists no widely accepted category system for describing or analysing the activities of the occupants of organisational positions [4] . "

there has been a considerable amount of studies which have used particular categorisation systems and allied methods of recording activity on small groups . In those studies were observer categorisation of organisational behaviour has taken place the question of observer reliability and inter-observer reliability have not been considered . Even in studies in

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1. Referred to hereafter as " diary " recording .
2. Recording of activities , with or without categorisation , by a person not actually taking part in the group .
3. W.R. Scott (1965) page 289 .
4. For a review of the categorisation systems which have been used in management activity studies see R.Guest (1960) .

the field of group behaviour the major concern has been inter-observer reliability [1] . The justification for this lack of interest in questions of reliability is explained by Scott [2] :

> " If the size of the work group is not too large an observer will not have too much difficulty in accurately recording frequency and direction of interaction among subjects . "

Problems as to the recording of the content of interaction and the possibility of recording the activities of individuals which are carried on without interaction with others remain unsolved . In the studies described in this thesis attempts have been made to characterise the content of group activity and to obtain information about the form of activities carried on by group members which do not involve contact with others .

Two special problems have often been associated with the use of observation recording in practise . It has always been accepted that the presence of an observer must induce some change in the characteristics of general activity patterns and specific behaviours observed . But there is very little concrete information from research findings about the existence or characterisation of the expected effect . There is some research which has suggested that the effect is very small and Blau and Scott have proposed a reason for this [3]:

> " The constraints [4] exerted upon the individual by the expected actions of other members of the organisation and his relations with them appear generally to be too great to let him permit the presence of the researcher to alter his conduct very much . "

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1. For a substantial treatment of sources of error with one particular system (Bales) see N.E. Waxler and E.G. Mischler (1966) .
2. W.R. Scott op cit page 289 .
3. P.Blau and W.R.Scott (1962) quoted by W.R.Scott op cit page 263 .
4. This sentence implicitly supports the model of group functioning i.e. activity is a function of struture .

The investigation of the possible effects of the presence of an observer on the the activity of the groups under observation was carried out during the research studies . This problem is a special part of the general difficulties of sampling activities which continue when the observer is not present - which may further encourage " atypical " observation records . The second problem associated with observation recording (as commonly practised) is the tendency to attempt to record more information than can either be recorded accurately or can be subject to analysis at a later stage . The best recording schemes of categorisation of activity are those which are the most simple [1] .

Diary Recording

The use of diaries , some mechanism by which the total activity of a manager is written down [2] and usually categorised by members of groups and organisations , has been often criticised .

> " ... the manager is bound to be somewhat biased in his view of the events which occur ... [3] "

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1. Bales limit of twelve categories has been quoted as being about the maximum for categorising individual behaviour . In the analysis of management activity ' phases ' or ' episodes ' more complex systems have been used . As an extreme case see H. Mintzberg (1970) page 90 :

   > " The categories are developed as the observation takes place . "

   For one of the few discussions about the history of the development of a related series of observation categories see N. Rackham (1971) and M.J. Colbert , M. Morris and S.B. Tribe (1971).
2. For an original contribution where the diary recording and observation recording methods have been combined see A.W. Palmer and R.J.Beishon (1970) .
3. Palmer and Beishon loc cit page 36 .

" Not one of these studies [1] provides substantial insight into the actual content of managerial activities ... [2] "

And the results obtained in studies support these criticisms . In the research reported by Weinshall [3] only 10 - 20 % of the categories recorded by pairs of managers involved in interaction recorded in diaries were in agreement . Part of this problem would perhaps be solved by the use of categories which are capable of comprehension by the managers used in studies [4] :

" High inference categories of interpersonal communication (sic) increase the probability that individuals do not agree when classifying specific communications . "

But the problem of the motivation of managers to carry on with recording over an extensive period [5] is as important an influence of suitability of data collected . A considerable researcher effort is needed to obtain the participation of managers in completing diary records with some degree of completeness . The main users of diary methods have been researchers who have either been engaged in management education[6] or have had semi-permanent relationships[7] with an organisational population . Even with such " captive "

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1. He is refering to the studies of T. Burns (1954) , R. Dubin and S.L.Spray (1964) , J.H. Horne and T. Lupton (1965) and R. Stewart (1967) .
2. H. Mintzberg op cit page 88 .
3. Weinshall (1962) page 651 .
4. P. Hesseling (1965) page 162 .
5. Most research has used periods of over a week . The Burns study (1954) involved diary recording over four weeks .
6. Worthy of particular mention are D. Marples (1967) using attenders of the Churchill College courses , R. Stewart (1967) and even the foundation work of S. Carlson (1951)
7. For example , P. Hesseling (1965) and (1969) , and Horne and Lupton op cit .

diary recorders there is a problem of continuing vigilence . Carlson [1] found that the accuracy and completeness of the ten managing directors in his study " diminished " after a week of record keeping .

Whatever the drawbacks of the diary method it was the only practical method by which information about the activity of managers in organisational groups [2] could be obtained with any degree of completeness of records . Hesseling has concurred in another research study [3] .

> " ... it (diary recording) is the most feasible method for quantifying interactions for a large number of professional participants . It becomes prohibitive in terms of trained observers and expense to provide each participant with a " shadow " ... the self-recording method results in a minimum interference with the normal operations of the participants . "

Two important precautions in the use of diary recording were taken before the method was used alone . First the recording mechanism and the model of decision-making and control activity were identical to that used used and found successful in the simulation study . Additionally the reliability of diaries was tested by the taking of a large number of observation recordings concurrent with the keeping of diaries by particular managers [4] .

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1. op cit page 51 . These keepers of diaries had been involved with Carlson in earlier management seminars .
2. The different locations of the members of a management group is a highly complicating factor . Many studies with real groups have limited the activity analysis to periods when all management group members are in face-to-face contact .
3. P. Hesseling (1968) .
4. Further tests of the validity of the method as used was acheived by checking the internal consistency of data within each diary record and the paired interactions separately recorded by two members of the management group .

Section Two : Preliminary Research Studies

This second section of the thesis describes the objectives and results of two early studies carried out using the resources of British European Airways . The first study described represents an attempt to investigate the nature of the decision-making and control systems in a part of B E A , and the relationship between these systems and the organisation structure . The method adopted was the " tracer " system . The results of the study confirms that the concept of decision-making and control activity is relevant for members of organisations but that the tracer method cannot , as used , produce more than descriptive information . The results of the study suggest that the focus of the research should be on the structure and activity associated with small - internally recognised - sub-units within the organisation .

The second study described in this section was a trial of the use of groups taking part in a business exercise as a source of information about structure and activity in task directed groups and the appropriateness of the concepts and measures described in section one . The results confirm the apparent verisimilartude of these simulated groups to real management groups and , through the success of the measuring devices , the suitability of the model proposed for this thesis .

Part One : Preliminary Organisational Analysis - Using Tracer System in Organisational Research .

The study described in this section was carried out between July and September 1966 . It was intended to both test some of the methodological aspects of the proposed research and to be the first of a number of nearly identical studies . The methodology employed was basically that which had been developed at the Imperial College of Science and Technology during the D S I R and later S S R C supported research studies into the role of Control Systems as intermediaries between the Technology of Production and the Organisational Structure . The most important method , at this date , was the use of a " tracer " as a means of identifying the control systems and production system associated with a particular organisational product . A recent review of the " tracer " approach as used in the Imperial College studies from 1964 is available [1] . In short , the tracer method is a method of following the logical administrative systems in an organisation (especially those associated with production control) by following the chronological effects of a single item associated with organisational production .

After some preliminary investigation of the various " Task activities " [2] in the airline it appeared that the operation of a particular airline route or route network was most conceptually akin to the production of a manufacturing article . There were three possible sources of change in this main task activity which could be used as the entry point for tracer study . These were :

a. Introduction of new routes in the airline's network .

b. Alterations or additions to existing services .

c. Changes in the type of service offered . For example , in the type of aircraft or passenger classes available .

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1. See chapter by P.Combey in F.Heller ed. (1973) .

2. Using the notation of J.Woodward (1965) chapter 7 .

All three changes were found to actually occur . There were some differences in the regularity of change . Type (b) were most frequent - a number are introduced on each new flight timetable [1] . Type (c) also appeared to occur at regular intervals . Type (a) were less frequent and were often connected with extra - organisational decisions [2] and with buying cycles [3] of new aircraft . A change in route operations of the type (b) and / or type (c) would provide a tracer which was most similar to the concurrent studies in manufacturing industry underway at Imperial College during 1966 . A specific problem which was foreseen before the tracer was begun was the comparitively long period of time needed to " follow through " the effects of change in the Task activity of an airline . Apart from the requirements of a change of type (b) and / or (c) , it was necessary to choose a part of the organisation where it might be possible to carry out the study over a period of months rather than years .

Certain changes which were to be introduced into B E A's Internal Services operated in Germany during May 1966 seemed to met the two requirements . In addition , there were a number of superficial similarities between the operation of these Internal Services and the BTA Business Exercise [4] . Perhaps of most importance for the possible success of the study , especially when it is recognised as essentially exploratory and unlikely to produce organisation useful results , the management of the Internal Services was keen to participate .

Appendix 4.1 gives an historical description of B E A's operations in Germany and details about the change in operations [5] which was chosen for use a source for a tracer study are included as appendix 4.2 .

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1. BEA timetables are changed on two occasions each year .
2. Government and I A T A decisions in the main .
3. On average there are some years between the purchase of new types of equipment .
4. See pages 97 to 98 . It was known at this stage in the research that the BTA exercise would be available .
5. Known as the " Silver Star " innovation .

Appendix 4.3 gives a description of the " organisation " of BEA Internal Services , Germany . Preliminary consultations took place with senior staff in Germany in the first few months of 1966 . The purpose of these meetings was to clarify the objectives and methods of the proposed study for the local management . Provisional agreement to the study was given and field work was effective from June 23rd 1966 when a two-day conference devoted to the subject of the project (the silver star service) was held . The task of gathering data was completed during September 1966 . Occasional visits to Germany were made after this date in order to interview personnel who had taken summer leave during the period of the main study . The study was completed by attendence at a second conference review conference concerned with assessing the success of the change in service and its operational and other consequences and problems .

3 Appendix 4.4 gives a list of the objectives of this study and the particular hypotheses it was hoped to test . The methods used to collect data in Germany were the following :

a. Semi - structured Interview .

b. Observation of Staff at work .

c. Examination of Records and Correspondence .

The examination of records was an attempt to reconstruct the effects of the tracer decision in the period August 1965 and June 1966 . The other methods were used to assess the progress of the tracer innovation during the operational period from the decision made in June 1966 to the institutionalisation of the innovation late in 1966 .

A preliminary categorisation was made of all response of staff interviewed into Information , and a second category of Opinions and Sentiments . A second categorisation of data , also made at the time of the interview , identified the topic of the response into the following classes :

a. Data relating to the Organisation Structure .

b. Data about their own work activities and with whom they have work contact in the Corporation .

and c. Data relating to control system(s) .

Within these categories there were a number of specific questions which were asked at each interview . The schedule used is shown as appendix 4.5. The chronological sequence of structure , work and work contacts , followed by control system information was used during all the interviews . Information was sought before opinions . At the conclusion of each interview sub-section the question " have there been any changes since the silver star service was planned / introduced ? " was put .

The order in which people were seen was determined by a combination of factors . The first , used whenever possible , was to progress " downwards " from the most senior person at a particular station , that is , from Station Superintendent to Officer level , down to Supervisor and Leader level [1]. The factor which effected choice was the availability of staff . This was particularly important for certain functions in Station management . For example , the Duty Officer or the Senior Traffic Officer was usually only available at certain times of the day for the extended time interval that the interviews required . Although a short memo had been sent round the German Area describing what the study was about some personnel had either not seen this note or had misunderstood the purpose of the study . The researcher was often regarded as either a person from the Area Office , Germany or a person from Head Office , London . On some occasions it was quite apparent that a person was getting into a set routine (usually comprising complaints and local problems) which were always produced for visitors from the more " important " offices . Some staff had also been interviewed by other " investigators " from central B E A functional divisions [2] during recent years which did lead to a certain reticence in response in a few cases until the objectives of the study were clarified .

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1. The M - Scales listed as appendix 5.2are not strictly relevant to either the locally engaged staff or the staff transfered from the United Kingdom . The titles given correspond to the UK use of these titles .
2. Especialy those sections of the organisation concerned with setting standards and checking performance . For example , Accounting section and Traffic Standards section .

Apart from responses directly related to the study there were two major preoccupations of the staff which came up at almost every interview . The first was related to the rigid career boundary between the British staff based temporally in German and the locally recruited German staff . British staff invariably held the most senior positions . At the time of the study , for instance , all Station Superintendent positions were held by expatriate British staff . This distinction was reinforced by the difference in the previous experience and comparitive mobility of these two categories . German staff had usually been employed at one station for between ten and twenty years and were , on average ; only in their second or third position within BEA . By contrast the British staff were transient - spending only a few years in each job - often at different locations within Germany .

The second preoccupation were the problems associated with economic inflation in Germany and the difficulty of filling vacant staff positions . Although this was felt by certain stations more than others and by certain departments rather than others it affected a large section of the local staff's activities at supervisor level and above . A number of people were under extensive work pressure because of the difficulties in recruiting staff .

Interviews took place not only in the respective interviewees' offices but also in the places of work where the function of the particular person being interviewed demanded it . This place of interview could therefore be , the tarmac , the cargo area , the engineering base at the various airports or even the departure hall of the airports .

The remainder of this chapter considers the results of the study in the Internal Services , Germany under the heads of the organisation structure , the description of work activities and contact with others , and the decision -making and control systems which were found . A final section summarises the conclusions to be drawn from this first preliminary organisational analysis using the tracer method .

Organisation Structure

Unlike the majority of units within BEA there were no detailed organisation charts available which described the hierarchy and responsibilities at the various locations in Germany [1] . The preliminary questions asked during the interview ,which related to responsibility , were therefore aimed at developing a picture of the actual management structure rather than to compare the perceived structure with the " real "-organisational recognised structure . Appendix 4.6 shows the organisation of the functional management section based at Hamburg , responsible for " policies " in the German area [2] and appendix 4.7 identifes the structure found at the ine stations in Germany which were studied . A total of forty - two staff were seen of the total of forty - four actually represented on these various organisation charts . The two Sales Representatives at Berlin were unavailable during the study period . A number of people , additional to those indicated on the structure charts , were interviewed [3] .

The charts in the listed appendices follow the accustomed distinction between staff categories . Each " band " of staff may contain as much variation in actual status and economic rewards as between the bands . The links drawn in between people do indicate a mixture of responsibility for tasks and decision authority. Wahn station , serving both Cologne and Bonn , can be seen as being different from the others in having no single person in charge of the station .

Once the organisational structure had been clarified at a particular station an attempt was made to identify the changes which had taken place since the adoption of the innovation in the service . A further historical study was carried out in parallel to the real time study to identify recent changes immediately before the present

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1. Appendix 4.8 gives an example of the usual visual description of structure as found in the BEA Organisation Manual .
2. Designated the " area " management .
3. Mostly operational duty officers .

study period [1] . In the three years preceding the start of the silver star innovation there had been no substantial change in either the numbers or responsibilities of staff in the Area and Station Offices . Some changes had taken place after the silver star service had been planned and just before the introduction of the new service . Some Station Superintendents had been exchanged between stations and a Catering Superintendent had been appointed . Neither of these changes in structure was specifically related to the tracer.

Work Activities

This was the area in the interviews where responses were most confident . Job descriptions for most jobs did exist - but in all cases were many years old and not updated . A standard of standard job descriptions had been adopted . Thus all the personnel in BEA whose job title was " Sales Officer " had identical job descriptions even though , in reality , detailed activities might be very different . There were many reasons why identically named jobs differed in content at the various stations in Germany . The two most important were related to the composition of the public using the relevant BEA services [2] at the station and a factor related to both the actual size of operations and the actual place of work .

An example of the first effect on work content concerned the Sales Officers jobs . In a number of areas business travel and cargo were more important than elsewhere . In these areas , therefore , there would be specific business organisations providing a large percentage of total revenue . In these areas Sales Officers are likely to be spending a good deal of their time in personal visiting . Where individual customers are less important the Sales Officer's work is more likely to be devoted to devising and

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1. A considerable number of records of the organisation before 1966 had been collected by the Manager (later General Manager) , Germany P.A. Gillibrand . These are summarised in a thesis for the Institute of Transport , London , 1963 .

2. Between , for example , " business " and " private "

implementation of advertising . The actual size of operations effected the operational work activities more than the sales and administration staff . Although the basic activities carried out at the various airports in total were the same the title of the staff who carried out specific tasks varied considerably . A one station the job being carried out by a Senior Traffic Officer might be the same that being done by a Duty Officer at another station . The only difference in this case being the frequency with which they carry out the common activities . A Senior Traffic Officer would be responsible for a total of up to sixteen flights per day, while the Duty Officer might be concerned with as few as two [1] .

Information about the work activities from job descriptions and implicit in job titles was therefore quite limited . Station Superintendents that had difficulty in describing their own and others functions in the stations were those in charge of the larger stations . It was in the smaller stations that Station Superintendents actually involved themselves in real operational activities , like dealing directly with passenger complaints at airports. An example of the detailed duties carried out by staff at each station is shown as appendix 4.9 . This gives the duties of the staff at Bremen which are additional to those specified in job descriptions . It is in lists of this sort that change due to the introduction of the silver star service would first become apparent . No changes had been registered in formal allocations of duties although 43 % of people seen at the various stations in Germany had identifed some change in

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1. There appeared to be a similarly direct relationship between the number of staff based at a Station and the frequency of comments made by people about the general pleasureability of work . This effect of increasing size of station on reducing the job satisfaction and some other disadvantages of " bigness " was particularly reported by staff with working experience at a number of different stations .

the type or frequency pattern of their work activities [1] . The great majority of changes which were registered involved change in the frequency as opposed to the basic characteristics of the work they were now performing [2] . It was of interest that when change was described by staff in Germany there was a common division made by the responders into change that had been expected and change that was a surprise . The second type of change was also usually identified , at the same time , as being both unwelcome and unpleasant . These two types , expected and unexpected , also seemed to correspond to a categorisation of changes in the decision -making and control process , respectively . This difference between planned for and unplanned change in work activities was also found at the main Area Offices located at Hamberg . An additional category of unexpected change was in many cases due to the inability of local stations being able (or unwilling) to make or carry out decisions about unfamiliar activities which were a direct result of the silver star innovation .

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1. Estimates of how managers spend their time obtained in a number of studies conflict substantially with the correct results obtained from observation (see S.Carlson 1951) . It could be proposed that the identification of change by staff might be subject to the same kind of inaccuracy . However , a different process is at work . Most of the problems associated with the inaccuracy of estimation is the meaningless of the categories presented by the researcher to the manager making an estimate . Estimates concerned with the more concrete (to the manager) concepts of with whom he communicates , the time spent in various media (face-to-face , telephone , and written) are more successful . A number of managers in the present study , for instance , knew the exact time spent on correspondence every day . Change in basic work activities seems a correspondingly concrete concept to people .

2. Change in various work frequencies 77 %
   Change in work type 8 %
   Change in both type and frequency of work 14 %

Decision-making and Control Systems

Implicit in the design of the study using the tracer method is an examination of the decision-making and control cycle relevant for the operations in Germany . The twice annual conferences held in Germany formalise the important decisions about the next timetable period . Two Internal Services Conferences were attended by the researcher as an observer [1] . The purpose of these conferences were interpreted diferently by the various attenders . Real decisions seem to have been negotiated previous to the meeting between the Area Management and the Head Office , London . Some participators felt that decisions were actually being made - others felt it was a public relations exercise : an endorsing of decisions already made . A few felt that the main stated purpose of the meeting , the decision-making about a future timetable , was basically an excuse for a general exchange of information and news about the Airline's operations .

In spite of the public relations activity of the conference they are undoubtedly important as'markers' in the decision -making and control cycle . Appendix 4.10 illustrates how the actual study period and the procedures related to important dates and decisions about the Internal German Operations . The shaded area indicates which sections of the various succesive decision-making and control cycles connected with different operating periods were analysed - either by historical reconstruction of through the interviewing and activity observation programme .

In assembling the data from interviews about the important decision-making and control systems it became apparent that , like opinions concerning the purpose of the bi-annual conference , there were a number of conflicting opinions . The majority of these related to the importance of the Area Office in Hamburg in making decisions in the area of general policy . Correspondence was available at the Area

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1. Munich , June 21 - 23 , 1966 . Decisions related to the Winter Period 1966 - 1967 Operations .

   Berlin , November 22 - 24 , 1966 . Decisions related to tc the Summer period 1967 Operations .

Office which gave conclusive answers . The different interpretations of the various staff in Germany about responsibilities for specific activities in the policy area is to be expected when contact between many of the staff is limited to an atypical conference meeting . The content and participants (both actual individuals and departments) in the decision about the basic frequency of operations are indicated in a table shown as appendix 4.11[1]. The specific contents of this table are considerations that took place in respect of the silver star innovation and would not necessarily be repeated at half-yearly intervals[2]. Apart from the primary decision about the total frequency there were a series of decisions made about each separate route in Germany . These decisions are related and dependent on the outcome of the main frequency decision . In practise the separation of these decisions from the decision process outlined in appendix 4.11 was a difficult exercise . A number of people interviewed considered that they were one and the same decision .

A second analysis of the primary decisions relating to the silver star innovation was to specify , in more detail , the various individuals and departments involved . A distinction was introduced into the type of involvement . Certain departments and individuals provided " inputs " into the various parts of the decision-making cycle without reference to the earlier activities in the cycle . The Finance Department in Head Office provided information which was important in the activity of Setting Standards but which was provided by that department irrespective of the particular problems of Internal Services Germany . Appendix 4.12 gives a list of these departments and individuals . Both those which were involved in decision-making and those which were important prescribers of decision activity are included . The distinction between these two is important primarily because those individuals and departments which merely specified actions in the decision and control cycle were not covered by this

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1. All analyses of the decision-making and control systems were made using the same model of the component activities in decision-making and control described in section one .

2. Market survey , for example , being an expensive operation , are undertaken only at irregular intervals .

study . This illustrates an important problem associated with using the tracer method in an organisation of some size . A network of inter-related and relevant managerial interaction and decision is uncovered which soon becomes too extensive for real time study - even for a team of researchers. Some further analyses were performed on further decisions which depended on the first frequency decisions [1] .

No changes in the decision-making with which they were connected - which could be identified as being due to the silver star innovation - was recognised by any of the staff interviewed .

Control Systems and Control Activities

The examination of the control systems and the control activities of staff covered in the study was achieved through the preliminary identification of the means by which information about the operating performance of the airline was " fed back " to individuals . All data was found to be in the form of load factors or the total number of passengers carried in particular periods of service . Ultimately it is necessary to convert these figures to Revenue figures and then to judge the success of operations by a direct comparison of the costs of offering the service against the revenue collected . However , the accounting organisation of BEA was not designed to produce rapid and relevant financial feedback to staff in Germany and the load figures were the feedback which airline staff used to assess the results of recent decisions and activities .

The five major sources of feedback information and some of the more important characteristics of each item are listed as appendix 4.13 . These are only the primary sources of data . A number would not be generally available to staff and much information was abstracted by the Area Office into other documents which had a more general circulation .

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1. Some of these analyses are in a report " A model of Control and the use of control systems in the analysis of organisations and simulations of organisations " S.B. Tribe Imperial College , October 1966 .

Two sources of information were important [1] . A more detailed model of the defusion of data from these feedback documents is contained in a report [2] . These documents appeared unimportant in the effect they had on the activities of the staff in Germany . Control of Task functions was based on the information obtained in the carrying out of required duties . This might be their own direct observation or information gained directly from members of the staff with whom they came into contact in their work .

Control activities were most frequently noted in the direct observation of directly operational based staff . Non-operational staff were better able to identify parts of their activities which were concerned with control of the results of previous decisions . But in all cases there was a descrepency between the various obtained estimates and the apparent frequency in activity records kept by the researcher . The concept, that certain of the staff would be more concerned with decision-making activity at an early stage , and with control activity at a later stage , of the tracer period , did not seem to be the case . Some changes in the type of control activities which staff were now concerned were noted . Staff admitted that , because of the interest they had in the new service and the new competitive environment , they had been eager to find out the commercial results of the silver starr innovation as quickly as possible - even if not demanded by the task constraints of their job . This was the first major change for many years and all were interested in the result[3]. A few Station Superintendents were spending considerably more time at their station airport than usual . The reason identified by them for this change was their wish to get a " feel " of the new service during the first few months of operations . Towards the end of the study there was , especiallyamongst staff who had been involved in the silver star concept at the planning stage , a recognised feeling of a return to normality .

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1. A regular duplicated letter from the Manager , Germany and a series of Marketing Information papers issued by the Sales Superintendent , Germany . There was no " company newspaper ".
2. " The Silver Star Service : an interim report " S.B. Tribe BEA Publication , 1966 .
3. It was common knowledge that " Head Office " was very interested in the results of the innovation . A kind of Internal Hawthorne effect .

Conclusions of the Tracer study in BEA Germany

In summarising the organisational research carried out in BEA Germany during 1966 it is necessary to contrast the results obtained with the original objectives and specific hypotheses for the project . In planning the research in Germany , the distinction between the use of data obtained from the examination of organisational control and decisional systems was made insufficiently clear . Two sets of data , with little inter-relationship between each other , were obtained . Additionally , while the interview schedule provided a mechanism for collecting information for building up a picture of the systems , the instruments were insufficient for the activity-based study . Most of the original hypotheses remain untested .

It is possible , in theory , to extrapolate from the decisions consequent on the Silver Star decision until a generation of dependent decisions is reached which is actually the concern of people as an on-going activity . The time interval between the initial decision and the period of activity observation in this study was too great to allow the construction of a " family " of interdependent decision-making and control activity Even where it was possible to specify an important secondary [1] decision it was not possible , with the resources available , to attempt an exhaustive tracing of the decision down to the level of individual activity by staff members .

However all the main objectives set for the study [2] were achieved. The basic Task functions in airline operations were identified in the study and the " control systems " associated with these Task function were described . The Organisational Structure of BEA in Germany was drawn up in terms of the internally recognised features of hierarchical levels , distributions of function and the allocation of control activities to members of staff .

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1. The German Area conferences were the sources of these . The presence of all relevant parties made possible the identification of secondary unique decisions related to the original silver star innovation .

2. See appendix 4.4 .

Changes due to the innovation were examined and comparisons were made with the basic characteristics of an apparently similar simulation exercise [1] .

The fate of the hypotheses give a more realistic assessment of the success of the project as organisational research . Very little can be conclusively said about the validity of the hypotheses as the great majority of data , both that summarised in this thesis and elsewhere[2], can only be described as descriptive . In particular , there was no real evidence that the first hypothesis , the most important , that the model of control and decision-making can be used for organisational analysis could be supported . No change in the control systems operant in Germany - which could be related to the innovation in the basic Task activity - was found . Similarly negative results were found for hypotheses three and four [3] . Hypothesis five , like the first hypothesis , remained untested : insufficent data being available . Hypothesis six was supported by data obtained during the study - no formal changes in organisation structure occured during the study although staff did recognise that there had been a significant change in their work activities .

The tracer method , used in the way described in this chapter , is not capable of producing more quantitified data . While a particular study using the method may produce insightful information about organisational structure and individual activity in organisations the data so-obtained will not be of great theory relevance . Furthermore , it is unlikely that information from one part of an organisation , obtained by the use of the tracer method , will be additive to the results of a second or further tracer studies in the same organisation . The reason for the use of the tracer system was that it facilitated the logical and chronological illucidation of the decision-making and control system evoked by an important Task decision . Unless a very substantial number of people are involved , either researchers or the participants themselves [4] ,

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1. See S.B. Tribe Imperial College Report op cit 1966 .
2. Imperial College and BEA Reports loc cit 1966 .
3. As listed in appendix 4.4 .
4. Involvement of the mambers of an organisation in a tracer study could include a diary - recording module .

this kind of tracer will never procede beyond the general identification of some priminary and " visible " decision and control mechanisms used in the company and will only sample the control and decision-making activity of individuals . Because of the absence of significant data relating to the activities of individuals the detailed structural description of the organisation of BEA Germany was of little use .

The success of the tracer was also adversely affected by the size of the unit of the organisation examined in a unitary study [1] . Although it was possible to examine the stations as smaller unit as far as the structure was concerned this was not a valid exercise for the control systems . In practice the control and decision-making systems involved a much larger part of BEA's total staff than the German Area . If access had been possible to all these areas it is likely that the quantity of people and departments identified as being involved would have been larger . If more precise data is to be obtained form organisational studies then the units of organisation examined and the focus for the study must be smaller than was the case in the BEA Germany study .

Apart from this conclusion as regards the size suitable for organisation theory research , the most significant result from this study was the ease with which an observer could classify real organisational activities being performed by individuals in terms of the decision-making and control model of activities [2] . In addition , the concepts of control and decision-making - both in terms of the organisation systems and the " labeling " of an individual's activities - seemed readily understandable to both Supervisors and Managers in BEA .

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1. The total number of staff in Germany during 1966 / 1967 was between the limits 870 and 920 . This figure includes a number of staff based in Germany for a few months at a time (airline pilots)

2. See section 2 , Part 1 .

Part Two : Preliminary Studies with Groups taking part in a Complex Business Exercise .

The B T A Business Exercise

British European Airways , like a verylarge number of Organisations [1] after the development of the business exercise as a management training tool , [2] devised its own complex business simulation based on the Airline industry . The development of this exercise and its validation as a method of teaching people certain knowledge items is the subject of a Ph.D. thesis [3] . Soon after the research in this thesis was initiated in BEA it became known that the groups associated with the training use of this exercise in management courses would be available for study . Crawford , in his thesis , had made an attempt to analysis the group structure , decision-making and certain other characteristics [4] of groups taking part in early use of the exercise during 1964 . He did not , however , use any measuring devices to procede beyond descriptive analysis . His use of psychometric methods has already been refered to [5]. The successful use of the B T A Exercise by Crawford to obtain useful data about group structure and activity did suggest possible further use in this present research .

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1. See the comparitively recent list of games , with short description of content , in Zuckerman and Horn (1970) .
2. G. Andlinger (1958) is usually cited as the first publication of a description of a simulation developed for training in industrial organisations .
3. J. Crawford (1967) . This research was carried out in BEA in the period 1963 - 1965 . An original thesis was prepared in 1965 .
4. See Crawford loc cit pages 90 - 123 .
5. loc cit Chapter 3 pages 41 - 57 .

Crawford has described the British European Airways Business Exercise (usually called British Training Airline or BTA) as follows [1] :

" In the game , three airlines compete for the passenger revenue which can be obtained from a common route network system consisting of six routes varying in length from 300 to 1,000 miles . Each airline is provided with identical starting conditions as far as stocks , available money and aircraft maintenance are concerned .

The internal organisation of the game parallels the organisation of British European Airways in that a number of specialised functions report to a General Manager . The General Manager is responsible for the overall planning and co-ordination , while the Specialist Managers are responsible for their own areas and for ensuring that their specialist areas are not ignored in company-wide plans . No allocation of specific players to specific functions is postulated and no attempt is made to influence the organisational pattern which the team chooses .

General management is concerned with the planning of generalised strategy , the calculation of detailed requirements in the way of passenger capacity to be offered on each route , the differential capacities to be offered on weekdays and weekends , and the division of capacity between first and tourist class accommodation . Although the decisions made by general management affect all functional areas , the carrying out of these decisions is left entirely to the relevant specialist function .

Production management is responsible for ensuring that the requirements of general management , with regard to the provision and disposition of aircraft are fulfilled , It assigns specific aircraft to the

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1. loc cit 31 - 35 .

routes , maintains the aircraft in line with laid-down maintenance schedules , ensures that an adequate supply of spare parts is held by the various stores in order to carry out necessary repairs , and controls the shipment of parts between the various store depots . "

There are many other detailed functional activities in the exercise similar to the described " production management " activity . These include market research , marketing , investment in new station facilities and a research and development activity .

BEA had been one of the first companies to use business exercises as a regular part of its management training . After some experience with a game originally produced by RAND Corporation for the United States Airforce and a variation of the Andlinger exercise a complex simulation specifically based on the conditions of the European Airline Transport market was devised . This exercise had , as its starting point , a more simple exercise which had been developed by Trans Canadian Airways [1] . Earlier exercises had been discarded because of the lack of sophisticated and involving decision taking , the absence of a genuine competitive situation - all of which led to face validity problems with participants in training courses from BEA . All decision processing in the BTA exercise was done by a computer programme and all accounting exercises were automated . BTA is one of the most complex specific industry simulations in the world outside of military establishments and was used actively by BEA in training courses over a period of eight years [2] .

The researcher took part in the exercise as an ordinary member of one of the teams playing the game which was part of a management course [3] . It was apparent from this participation , as well as from later observation and questionnaire technique , that the exercise is highly motivating and requires a considerably quality and quantity of mental effort .

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1. Later known as Air Canada .
2. From 1962 - 63 until 1970 - 71 .
3. Appendix 5.1 gives a typical course programme for the Basic Management Course .

Some records relating to plays of the exercise in the management training use of BTA before the research was started were available . This data consisted mostly of the age , organisational background , and current organisation position held by the various course members - a record of the groups to which particular course participants belonged - and the profitability record of the groups attempting the exercise . Structural measures - or any development since Crawford's work [1] had not been continued . In the time-span over which the research in BEA was planned it was known that there would be three distinct types of management " course " in which the BTA simulation of Airline Operations would be used . The early use of the business exercise for a junior management course had been extended to include a more senior management course and an international " seminar " type course . These three populations of courses were :

1. British European Airways Staff (and occasionally associated companies) nominated for the Basic Management Studies Programme . This programme was a series of educational units , both courses and private study . The residential two-week course , of which the management exercise was the main component , formed the largest part of the programme . The programme was open to men and women on a Pay scale of M 2 to M 4 [2] . In practise people outside these limits frequently attended the course . This was due to either an expected promotion or a change of job just before attending the course .

2. Similar to the above population but covering staff in the M 4 / M 6 range . This course lasted only a week . The business game was shorter than that used on the B M S course ,

3. Members of the senior management of various European Airlines - together with ocassional groups of BEA and BOAC managers . Apart from the educational object-

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1. A limited sociometric study had been carried out .
2. Appendix 5.2 gives the M scales and associated salary ranges .

ives , there was a definite intention of promoting inter-airline contacts . The tackling of the exercise was the only activity of a full week and the stage reached in the completion of the exercise was usually somewhere between the positions reached by the two BEA courses .

Appendix 6.4 gives a sample of the participants list in these three types of courses .

The Design of the Preliminary Study

This study was undertaken at an early stage in the total programme of research carried out using facilities provided by BEA . Its main function was not to be a complete research project in itself but to act as confirmation that the groups taking part in the BTA Exercise would provide a field opportunity for testing parts of the model presented in section one of this thesis . The intention was that some of the more important findings of that Crawford had reported should be further tested and interpreted more specifically in the concepts and measures of this research . A series of hypotheses based on these propositions was drawn up [1] . It was not expected that , as measuring instruments were developed during the study , data would be available to enable a testing of all these items .

The method used to obtain the bulk of data from group meetings was the method of making direct records of activity by an observer present in the same room as the groups taking part in the exercise . A system of pre-categorised activity record sheets[2] - made up into booklets - was employed . A single book of these formswas left in each of the three rooms in which groups were taking part in decision-making for the BTA Exercise . A system of activity sampling - the sampling being applied to both the section of groups and the order in which the activities of individuals in groups were recorded - was used . The use of this method was been generally reviewed[3].

1. Shown as appendix 5.3 .
2. Shown as appendix 5.4 .
3. For three contrasting reviews see comments in R.W. Heyns and Lippert (1954) , R. Stewart (1964) and H. Mintzberg (1970) .

The main problem foreseen with this kind of sampling of observation and activity recording is the possibility of observer effect on observed behaviours[1]. The important disadvantage of using activity sampling technique is not that this distortion may exist but that it is impossible to measure the degree of distortion present . This problem exists with all behaviour and activity recording made by an observer . There were three separate parts on the observation form for each " entry " . The first was concerned with the identification of the person in the who is involved with the particular activity in the group which is proceding . The second part indicates the type of activity which is proceding - classified according to the model of decision-making and control activity related to task completion . The final part is concerned with the identification of the actual topic under consideration during the activity - topics which are obviously related to the tasks required in the simulation exercise . Number and Letter codes were used to effect a miniaturisation of the recording from so data from as many as nine episodes could be entered on a single page of the recording booklet . A guide to the codes used in the form and the completion of record is given in appendix 5.5 .

The observation procedure used as follows :

> The random generating device used to decide which room should be entered next was a set of three cards with groups' numbers written on them . While this may sound a little unnecessary when dealing with only three groups it did ensure that groups could not predict , and therefore prepare for , the next " visit " of the observer . On entering the room the observer picked up the recording booklet which had been left in the room from the last observation visit and sat down in a positioned seat with good visibility of all group members . Group members were observed and their activity noted in a sequence which was determined by random number tables positioned in front of the observer . If a person being observed

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1. See M.J. Colbert et alia (1971) .

was in communication with someone else then that person was also included on the record for that particular episode in the appropriate position on the second line . An episode was considered completed when the observer had had sufficient time to complete both the purpose and topic sections of the form . If a person selected through random number tables had already communicated with a group member whose " episode " had been recorded earlier in this particular " visit " to the group then a new person episode was still recorded . Unlike the great majority of activity and behaviour recording systems , an entry was made even when the person selected was silent . If he doing something purposive - with respect to the group task , usually the case with groups carrying out a complex decision based exercise - then the form was completed as fully as possible . If necessary the material the person was working with was quickly examined by the observer looking over the shoulder of the relevant person . The method of identifying the topic by identifying the page numbers of the two major documents used in group was of great assistance in these cases . On leaving the group room the observer would replace the recording booklet - with as many new entries as group members - in a prominent position in the group's working room . Time spent in carrying out the recording of information varied from between a minute to about ten minutes . Although the purpose of the recording scheme had been explained , and the type of entry made clear to all participators on the course , the groups were interested in looking at the recording booklets to confirm that recording was as expected .

A total of nine groups were looked at during this first initial research exercise . Data was was obtained from these groups whose combined " lifetime " over the three courses was eighteen weeks . This means that a little over two hundred hours of group discussion , activity and decision-making were monitored through the observation sampling method .

Results [1]

The mechanism of collecting data proceded well and there appeared to be little disruption caused to the groups taking part in the exercise . Because of detailed briefing given by a member of BEA's staff before the exercise was begun all six groups devided up the tasks required in the exercise and allocated these to the various members of the group . This allocation was , without exception , the very first activity that any of the groups carried out . It was also carried out without reference to the likely demands of each " function " . There appeared to commonly accepted ideas about the relative status of each of the required functions . Groups , for instance , always elected or appointed a Chairman first and certain comparitively routine - sounding activities , like Production Management , were amongst the last alloted to individuals . Even when it became manifest to all members that the original allocation of duties had been made incorrectly , either in terms of the abilities of individuals or the work-load , there was a very great reluctance to change the " organisation " of the group . In the courses observed there were no changes in the person who played the role of Chairman and only minor changes in other functional roles in the game .

This finding that the roles of group members are stable through time , even when the group is quite unsuccessful in its task accomplishment , is not a common result of research using small group experiments . It does , in fact , contradict much reported research on groups under conditions of perceived failure . The explanation is , perhaps, that most research utilising groups working on tasks has obtained the participating members from different organisations or from an organisation which has no relevance to the task of the group[2].

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1. This is only a summary of those results which were important in deciding the framework of the studies described in sections three and four of this thesis . A longer report of the results is contained in a BEA Research Report : " The use of Simulation methods in the research " 1966 pages 51 - 96 .
2. See page 67 of this thesis . The majority of tasks are also trival . See Zelditch and Evan (1962) .

When the members of a group all come from the same industrial organisation , when the results of their activity may be quite commonly perceived by many individuals as influencing their career in that organisation, and when the tasks they are asked to perform have considerable verisimilartude with their industry , if not with their own jobs , [1] there will be a considerable barrier to overcome before change in a training situation is suggested .

Changes in Groups over Time

A serious objection to the use of business exercises as a source of groups tackling tasks is the discontinuous existence of the groups . In the BTA Exercise , as with other business simulations used for teaching objectives , decisions are made by the groups , sent away for processing by a computer on a batch basis [2] with further group meetings making further decisions at some later time . Intervals between successive plays of the exercise varied between two and three hours and twelve hours [3]. In fact most sources of simulations for group research also have a discontinuous existence - but so do real organisational groups . Members attempting a business exercise on a management training course do have some special distractions which might significantly effect their behaviour in a group situation compared with normal . They are living away from home , subject to rather more demands on their intellect than usual and , in the BMS course , must listen to formal lectures and take part in case study exercises between units of the BTA Exercise . The first series of analyses were directed at examining the trends in both the structure and activity [4] of the groups during the

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1. Some of the most useful group research has been done with groups which have been drawn from a single organisation carrying out an organisation relevant task . Youth organisation groups (R. Lippert 1940) , Military personnel (F.Fiedler 1966 , C.H.Castore and S.Streufert 1968) .
2. Recently there have been trials of real time business exercises see use of telephone terminals in P.N. Wahi (1971).
3. Apart from the longer weekend break on BMS courses .
4. Structure and activity used here and in the rest of this chapter does not correspond exactly to the definitions later adopted and given in section one of this thesis .

various stages of the business exercise .

The first analysis was an investigation of the involvement of members in the groups during the early part of the exercise A common experience in groups used for training purposes is that extremes of contribution to group activity do exist , especialy when the group is above a certain size . The purpose of this analysis of the time that each member spent in communicating with others was not to ensure that these extremes did not exist but to find out the range of contributions obtained with this particular business simulation and its range of implicit tasks . Appendix 5.6 shows the results , displayed graphically , from the first course in which observation was carried out , Basic Management Studies course 13 . In a preliminary examination of these results the activities of each syndicate member were identified in a simple time series analysis as divisions of tasks and responsibilities were not identical . Even from this first course studied there was , however , evidence that the contribution pattern (particularly subsequent to the first decision) was related to the " job " that the person was carrying out in the group . The person who interacted least in all three syndicates was carrying out the stock-holding sub-task in the exercise . Similar results were obtained for the six other groups included in this preliminary research . The graphs for BMS 13 indicate that , even for the person who was working most by himself ; the figures of the percentage of time taking an active communicating role was always above 50 - 60 % of all episodes in which he was recorded . The specific absence of both a sudden change after the first few decisions or a later development towards the end of the exercise was the first indication obtained that comparitive stable group environment exist in this particular exercise .

A second analysis was performed with the separate frequencies of decision-maing and control activities of the group as a whole . Again , the major aim of graphing the frequencies [1] was to test for the apparent achievement of a steady-state

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1. Shown as appendix 5.7 in a series of graphs .

period in the existance of the groups which would suggest the use of this simulation for organisation theory research based on examination of small groups . In addition , it was essential to have an indication of the developmental changes which occur in groups and the time needed to approach any stable state . The existence of a development stage in the structure of the groups playing the BTA Exercise had been noted by Crawford [1] and has been a general research finding in a number of studies with quite different methodologies [2] . The set of graphs which make up appendix 5.7 do not include results for the activities of clarifying problem , identifying outcome and sensing . Difficulties were experienced with the operational definition of the category of clarifying problem and the researcher was aware of a change in the use of the definition before within and between courses . Although preliminary graphs of the frequencies of identifying outcome and sensing were constructed these graphs appeared to correspond very closely to graphs drawn for evaluating outcome and discriminating activities , respectively . These graphs were later mislaid . Some further analyses on this data were performed during 1966 and a more extensive report on the frequency of activity in this first study of simulation groups has been included in a review article [3] .

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1. loc cit pages 90 - 110
2. Bales and his early co-workers were particularly interested in this phenomenum . See Bales (1953) The Equilibrium problem in Small Groups , Bales and Strodtbeck (1951) Phases in Group Problem solving , and Heinicke and Bales (1953) Developmental Trends in the Structure of Small Groups . For contrasting approaches to the investigation of changes in groups see Philp and Dunphy (1959) Developmental Trends in Small Groups and Guetzkow and Dill (1957) Factors in the Organisational Development of task oriented groups .
3. D. Kitchen (1970)

For these three courses the external structure of the course [1] were identical . The data representing the last decision period has not been included as activity during that period , like the " trial [2] " period , is a little atypical . In the analysis included here three characteristics of these records of group activity during the exercise are examined . These are :

a. Trends for each group through the exercise .

b. Differences and similarities between groups as regards the frequencies of particular frequencies of activities .

and c. Integrative aspects : like , for example , the relationships between the frequencies of several activity categories .

a. Trends in group activity frequencies through time

For a number of activity categories there is a problem of a low number of absolute frequency for graphical representation . Low frequencies for particular groups and decision periods are found present for the activities of setting standards and setting goals . Other activity categories which provide low frequencies on some occasions are , evaluating outcome , choosing action , and discriminating . For the categories where frequency is higher (particulary identifying action and effecting action) their is a much greater chance that the graph indicates a real variation in frequency than possible randomness - associated , perhaps , with the observation sampling method . However , even in the low frequency graphs , the " smooth " nature of the frequency graphs suggests that random factors are unimportant .

In the great majority of the graphs there is a initial increase in frequency during the first few decisions while there is an almost equivalent decrease during the last two decision periods [3] . Although not apparent from

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1. Like , for instance , the set of lectures given , type of briefing given for the exercise .
2. See page 138 for an explanation of the trial decision .
3. This was also continued in the last decision period which was excluded form the time trend graphs .

an examination of the separate category graphs there is a further increase in overall control and decision-making activity until period five after which there is a slight decline until period ten when a significant fall takes place . The category of effecting action was an exception to this trend . The number of episodes which could , in some way , be labelled as being concerned with effecting action increased during the whole exercise . The explanation for this different pattern is due to the lack of time pressure on groups during the second half of the exercise . The amount of real decision making becomes less as certain decisions become programmed[1] and the actual completion of the decision forms (the group activity which corresponds to the activity category of effecting action) becomes a leasurely and extended group task .

b. Comparisons between records for different groups

Within each set of nine graphs which make up the record for a single activity in the decision-making and control activity model a number of analyses can be performed . Comparisons can be made between the sets of courses containing three activity records and between group records without reference to which course groups were part of .It is also possible to compare the records with reference to the particular designation of the groups within their respective courses , that is, Groups 1 , 2 , and 3 [2]. It was judged that the varying conditions implicit in these designations was insufficient to warrant a distinct statistical treatment.

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1. Programming of decisions implies that certain procedures which might be taken when the makers of decisions have little knowledge of the constraints effecting decisions become either non-existent or a mere clerical exercise because of developed experience . This use is identical to that developed in J.March and H. Simon (1958) .
2. All groups with the same designated number are allocated the same room for group meetings . Some difference in comfort and facilities (blackboards and whiteboards) were implicit in these rooms .

Even with a sample size of only nine groups there are some considerable differences between the frequency patterns found during the exercise . This variation was present in all activity categories except for the decision category of identifying action . Variation beteen groups was greatest in the records for setting goals , setting standards , and evaluating outcome . There was no indication , either from visual examination or by tests of statisical significance , of difference between the patterns and mean values obtaining for the three groups making up one course compared with the other two courses . By contrast , there are many significant differences between the patterns and mean values of the frequencies of categories between particular groups . The trend of the frequencies of BMS 13 group one and BMS group one - for the categories of evaluating outcome and setting goals - is an example . In these instances there is a significant difference between the actual frequency of both activities even though the general trends are quite similar [1].

c. Integrative time series Results

The apparent consistency between the patterns of frequency obtained for one group in several behaviour categories is more extensive than was illustrated in the last section . BMS 15 group one had the lowest frequency of all nine groups in five of the activity categories while BMS 13 group two had the highest frequency in four activity categories . This consistency between activity frequencies within the records for particular groups was not found for all groups even though the trends of absolute frequency changes were followed in all groups .

The most important finding in this examination of the observation records for both individuals and for total groups was the stability of obtained measures of activity . This suggested that it would be practical to procede with more refined measures of group activity and that groups using the BTA Exercise as a basis for a task might provide a useful mechanism of examining both activity and structure of groups tacking organisation-like tasks .

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1. In neither of these instances does the maximum frequency obtained for BMS 15 group one exceed the corresponding minimum frequency for BMS 13 group one .

No effect on the relative frequency of decision-making and control activity which could be held due to course of "origin" of each group . This indicates that the different environments external to the game activity seem unimportant in influencing groups . This result is of particular importance for future studies in which changes would be introduced into the training course and where two other sources of BTA Exercise groups - very different in course content - would be used .

Spatial Effect on Interaction in Groups

After groups have alloted themselves various tasks a secondary structure decision is often the seating positions to be adopted by group members around the table(s) where all future group activity takes place . It is likely that the actual position taken up by people may have some considerable effect on the relative frequency of interaction between group members [1] . But any investigation into the extent that communication between individuals is related to their relative proximity must take into consideration the actual distribution of tasks which the group has adopted . The specific seating arrangement is often perceived by the group as being important and group members whose tasks are recognised as inter-related are placed in proximity . However these perceptions , when present, are not the same for different groups . An example of how " circular " interaction of group members is developed from a spatial / task structure recognition of groups is the example shown in appendix 5.11 . Further complications arise in any attempt at analysis because of the varying number of people in groups and their exact position around the standard table .

For the purposes of an Analysis of Variance exercise each relationship between pairs of group members was classified as being either near , opposite or furthest . The figure over , showing the typical seating arrangment for a six-member group , serves to illustrate the scheme of categorisation of relationships .

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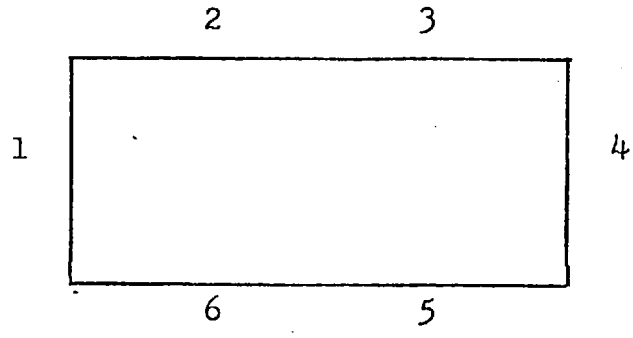
1. The frequency of interaction between pairs of group members that are favourably spatially arranged being higher than for pairs which are less favourable .



For group member one the nearest relationships are 1 - 2 , and 1 - 6 . There is one opposite relationship, that is , 1 - 4 . The two remaining relationships , 1 - 3 , and 1 - 5 , are furthest relationships .
For group member six the nearest relationshipsare 6 - 1 , and 6 - 5. The opposite is 6 - 2 and the two furthests are 6 - 3 and 6 - 4 .
There are only these two unique positions with this spatial arrangment of six members , illustrated by these two members one and six . There is considerable variation within the three classes of spatial pairs chosen . In the two opposites the physical distance between 1 and 4 is almost twice that between 6 and 2 . Furthest positions have been determined not by the physical distance but by the masking effect that other members in the group having on interaction between this pair .

Statistical one-way analysis of variance tests with interaction data between pairs categorised according to this scheme gave F values which were significant beyond the 0.05 level . Thus the frequency of interaction between pairs in the group is significantly related to a classification of the relationship according to a simple spatial assistance to interaction model . Unfortunately , the exact spatial arrangments of the first nine groups was mislaid following this first statistical test . Included as appendix 5.13 are the corresponding Interaction patterns , frequencies of activity between pairs of members accorded to the three categories , and two separate analysis of variance exercises for three groups making up a later examined training course [1] . Both analyses indicate a significant (0.05 and 0.001 levels) difference between frequencies found in the three categories of paired relationship . This data included information collected from the fifth to the ninth decision periods and activity involving more than two individuals has been excluded .

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1. All three groups contained six members arranged as above .

Financial success in the exercise

One of the original hypotheses sought to investigate the relationship between the financial success of groups and the structure adopted by groups . An analysis was made of both the characteristics of the financial success achieved by groups as well as the apparent financial strictures implicit in the simulation design .

The design of the game is such that the profit obtained by individual groups and the total three groups on a particular course is a complex result of the decisions made by all three groups . In theory , therefore , the financial success of one group must be dependent on the other two groups . Before the parameters in the original revenue and profit model and the operations performed with the decision figures had been fixed in exercise design a series of trials of the exercise with groups had been carried out by Crawford . This procedure had ensured that the training groups in the course use of the exercise could make a profit over a two year operating period (made up of 24 decision periods) . The educational argument given by Crawford was that the continuation of a loss position would be " demotivating " . This logic was also followed in the period of the year with which the exercise starts : this is the summer period when it is possible to obtain large profits . During the study described in this section and that in section three of this thesis all decisions began with the month of May . The " month " of the last decision varied for the different types of course and individual factors in courses . In these first three courses studied the decision making was continued up to decision (month) twelve . The cumulative profit at the end of month twelve was considered by the course directors as a measure of the relative merit of the three groups on a particular course . A discussion of the ways in which groups can maximise profit during the last few decisions - outside the normal"sensible"decision-making in the game-is included in a later section devoted to the measures of financial success in the second use of the exercise in the research [1] . To avoid the problem of judging which groups did

maximise their " paper " profit by untraditional means during the last few exercises the briefing given to groups before the start of the exercise was changed . This new information made it clear that the objective of the game was to maximise their profit and that untraditional means of achieving this during the last few decision periods were permissible .

The sensitivity of a group's financial success to particular decisions or class of decisions made by groups was not known at this stage in the study . In practice some model limits on the values of certain decisions were provided in a supporting manual describing the BTA exercise for course members . There are only a few decisions where the entry of a particular value in a decision form for a period would commit a group to poor financial results for future periods . The majority of decisions made by a group for a decision period influences only the profit in that decision period . However , because an error made in certain portions of the decision forms [1] would have a permanent effect on the future profitability of a group , some errors were sought by the course directors and returned for correction to the members of the group [2] .

An examination of individual profits obtained by each of the twelve groups during the exercise - together with profit records of previous courses - indicated consistency in every groups profit levels (taking into account seasonal variations) through the twelve decision periods . On no occasion did the relative rank order of profitability of each of the three groups on particular courses change for any of the twelve decision periods . No statistical tests were attempted because of the low number of results .

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1. Six forms made up the completed series of decisions made by each group . These were pre-printed and numerated to aid computer processing of the decisions . Up to ten entries were required on each page .
2. Mistakes were particularly prone during the first few decision periods when members were under some time pressure .

Allocation and Stability of Members' tasks in Groups

For each group in this study there was an explicit internal identification of tasks necessary in the exercise and formal allocation of particular tasks to group members . Groups frequently recognised the relationship which existed between the individual tasks . The briefing which had been given to groups contained a great deal of advice about the importance and sequence of a number of important tasks which groups have to complete in order to attempt the exercise . Appendix 5.9 gives the designation of tasks carried out by the group members of groups in the course BMS 13 . These descriptions of tasks were identified by the observer during the first few decision periods apart from keeping observation records . Changes , in all the groups observed , only occured when there was a recognition that activity levels within the group were very uneven . The only changes which did take place were quite minor , secondary , tasks - and the structure of tasks identified in appendix 5.9 is relevant .

The indirect method of identifying the tasks with which members of the groups were concerned during group activity , by noting the material they were using , was quite practical in use . Appendix 5. 10 indicates the comparitive frequency of the use of each page of the two important documents connected with control and decision-making activity for one group . Pages in both these documents are not totally concerned with specific types of group tasks and proximity of pages does not indicate logically related tasks . This profiling of member tasks was particularly designed to make comparison between courses possible because , for example , the task " label " of Market Research may contain different component tasks in different groups .

Organisational Structure of Groups in the Exercise

Corresponding with the stability in the frequency of decision -making and control activity and the task carried out by members there was a stability in the organisation structure adopted by groups . With such small numbers of people involved in each group it was comparitively simple to specify totally the

organisation structure . In usual organisational charts the constructed hierarchy can have a number of interpretations . In this study the structure represents the authority structure - who makes decisions for which tasks - as noted by the observer . A number of the groups did , in conversation with the researcher , indicate that they considered they were working as a " team " - all decisions were reached through democratic and participative decision-making . This was , however , the case in these groups for only short periods and for only a few important decision . This result is a significantly different result from that obtained by Crawford [1] working with the same group simulation . The only identification of structure made by the groups themselves was the frequent designation of a single group member as a group " Chairman " . In appendix 5.9 the organisational structures for three groups are illustrated in the conventional manner . In these three groups only two groups (groups 1 and 2) had recognised formally the presence of a chairman role[2]. Groups were more interested in the direction and chronology of the various information and decisions necessary within the group to produce a portfolio of decisions within the time allowed by the course administrators .

Relationships between phenomena in Groups .

The results presented up to this stage have been concerned with establishing the characteristics of group structure , activity and financial success , and , particularly , the stable nature of these throughout most of the use of the training exercise BTA . The examination of relationships between group variables was carried in a sampling manner , determined by both the list of specific hypotheses made for this study and the form and results of Crawford's earlier work . The type of analysis which can be carried is also limited because of the low number of groups studied . The relationships are considered under the following headings :

a. Interactive / Individual Episodes in Groups

b. Decision-making and Control Activity frequency

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1. op cit page 76 .
2. Although " Chairman " was the word in most common usage the groups recognised that the current semantic meaning of the word was inappropriate to describe the function .

and c. Organisational Structure and Interaction

a. Interactive / Individual Episodes in Groups

The first analysis , as in the time series results , was an examination of the total frequency of interactive episodes in particular groups compared with the total number of individual episodes recorded . Within each group there was a high correlation between groups having a high frequency of interactive episodes (both total and as a proportion of all episodes) and the finishing position [1] (rank in final cumulative profit) . Using the same figurative method [2] as Crawford we can display this as a table :

Highest	frequency	1	1	1
Medium	of interactive	2	2	2
Lowest	episodes	3	3	3

Ranking , by final cumulative profit , in each of three courses

A further ranking exercise using the data from all three courses [3] with a rank based over all nine results produced the following correlation :

		Rank by Profit
	1	1
Frequency of	2	2
Interaction	3	3
Episodes as	4	4
a percentage	5	5
of all Episodes	6	6
	7	7
	8	8
	9	9

1. Ignoring possible interaction between groups on a course .
2. The three columns represent (from left to right) groups in courses BMS 13 , 14 , and 15 respectively .
3. The proportion has been used because of the varying times spent on observation in different courses .

b. Decision-making and Control Activity frequency

The time-series analysis of the various activity categories in the decision-making and control model indicate three activities with the greatest consistency through the exercise and which showed largest differences between groups . These activity categories were setting standards , setting goals and discriminating . For the purposes of an analysis these three sets of frequencies were ranked for each group within a course and this was contrasted with the equivalent profit rank . The following result was obtained for all three courses examined :

Highest	frequency	1	1	1
Medium	of decision/	2	2	2
Lowest	control activity	3	3	3
		Ranking , by final cumulative profit , in each of the three courses		

An additional ranking exercise , using the rankings of groups in profit[1] and in activity category frequency , supported the result of this analysis . In only a single case within the three ranking exercises corresponding to the three activity categories considered was there a difference between the relative activity frequency and the relative profit result . No other apparent relationships between the various categories of activities and the financial success of groups were found .

A final investigation was concerned with an extension of the simple / complex analysis which Crawford had attempted . For every episode recorded the total number of activity categories identified was used as

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1. Considered without reference to course of " origin " .

a measure of the complexity of group activities . The mean figure for each course was calculated . The result of a ranking exercise between the comparitive complexity of episodes between groups in a particular course and the associated profits was :

Most " complex "	interactive	1	1	1
Intermediate	episode	2	2	2
Most " simple "		3	3	3
		Ranking , by final cumulative profit , in each of the three course		

Ranking within each course corresponds exactly .

c. Organisational Structure and Interaction

In earlier analyses the task and authority structure found in the groups studied had been separated . In any analysis of the relationship between the nature of the interactions developed between members of a group and the " structure " of that group these two aspects must be considered at the same time . The spatial arrangment of group members has been shown to be important , but cannot be separately assessed in groups where differentiation of tasks takes place and where spatial arrangment id determined by the groups' perceptions of the need for two members " to work closely together " etc. Syndicate one of BMS course 13 provides an example [1] of a group where some separation of the effects of spatial arrangement and the logical relationship between tasks can be seen . Communication between group members placed by the side of each other is much greater than the equivalent communication across the table . All , except a single exception , of the seven most used " interaction pairs " are in accordance with the identified authority structure for this group .

1. Figure one in appendix 5.11 . This appendix combines information about the spatial arrangment of the group with the authority structure and the relative frequency of communication between group members .

The second example in this appendix represents the three corresponding features for group three of the same course . In this instance the most important (in terms of absolute frequency) communication between pairs of group members is across the table at which decisions are made . Additionally there is much less correspondence between the " communication structure " and the authority structure .

The first group given in this example was the group which obtained the best result in this first sample of nine groups in three courses . By contrast,the second example was ranked eigth in profit out of the total of nine groups . A relationship between the degree of correspondence of communication and authority structure and the financial result obtained by groups is suggested by this finding . In addition , these two examples given represent the extreme cases of agreement with and divergence between authority and communication structures

In a number of research studies using groups, tasks have been set for completion which have a known communication network (and sequence) which is necessary for optimum performance by the group [1] . Hesseling [2] was able to give exact totals of the number of contacts between members required for the completion of his exercise developed for both training and research use . He was also able , as a consequence of a known task structure and sequence , to examine phase problems in task completion and measure increasing and decreasing activity associated with particular members of groups . He did not , however , attempt to relate success to the degree to which the groups actual communication corresponded to the known " ideal " model and the associated success with task performance .

It is not possible to be so specific about the required contact between individuals carrying out the BTA exercise in groups . This is due to the non-specification of

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1. See section one page 46 .

2. P.Hesseling (1965) pages 72 - 76 .

a set of constant sub-tasks to individuals in the group . This in turn is due to the use of the exercise in a training dominated environment : courses can determine which tasks should be allocated to which group members and the number of individuals making up a group is subject to high variation[1](although not in these first three courses examined) . The designers of the BTA exercise had made extensive studies in many parts of British European Airways to ensure that the required interactions between functions included in the exercise were as realistic as possible . For the purposes of this study a " relational map " of the required main sub-tasks required in the game was constructed . In this " map " [2] sub-tasks which are related in the sense that communication between the people carrying out those function pairs have been linked . In addition the apparent importance of the connection has been indicated by the closeness [3] shown in the illustration . The twelve sub-tasks identified were not always identified as distinct sub-taks by the exercise groups . In practice , with only five or six members in a group , a number of sub-tasks would be performed by some individuals . It is to be expected that those groups which have " collapsed " closely related sub-tasks into " jobs " for individual group members will be more successful in their decision -making than others . The situation is somewhat complex due to the problem that the work-load associated with logical pairs or triplets of sub-tasks may be too great for a single member . The spatial effect problem exists additionally . With this selection of nine groups it was not possible to determine or consider the various influences of structural factors on groups' financial performance .

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1. Hesseling (1967 page 70) needed to use six managers in his exercise .
2. See appendix 5.12 . A total of twelve sub-tasks have been included .
3. The sub-task of Research and Development is entirely " self-contained " . It is included for reasons of comprehensiveness of all sub-tasks .

This apparent inter-relationship between the various structural measures of groups and between these structural characteristics and the patterns of interaction is an important result of this first study using the BTA exercise .

General Conclusions

While the results of measuring structure , activity and the financial success of groups carrying out the the BTA Exercise were interesting , and suggestive of further research areas , the detailed results were of little research value . Particularly effecting the usefulness of the data , and the statistical methods available , were :

a. the low number of groups examined .

b. reliability problems of the researcher assessment of group authority structure .

and c. the uncertainty of the degree to which a groups financial success is compounded by the relative success of the two other groups making up a course .

The time series studies , while basically descriptive , do confirm that groups associated with the BTA Exercise do develop both stable organisation structures (particularly task and authority allocation) and activity patterns (both considered in terms of individual/interactive and in terms of a model of decision-making and control activity) .

As a consequence, the use of the BTA Exercise was included in the main design of this research carried out in BEA . This second use is included in section three . In constrast to this study this later use included the following :

a. a large number of groups contributing meaures .

b. development of questionnaire methods for the identification of structure measures .

c. an extensive consideration of the profit obtained by groups making up specific courses .

Further influences effected the final design of the major use of the BTA exercise in this research quite apart from the results obtained in this study . These were related to the requirements due to the research model as finally formulated in section one of this thesis and the research decision , made after this early use of BTA had been completed , to use a similar methodology and specific methods to examine corresponding structure and activity characteristics of real managerial groups .

Section Three : Research using Groups carrying out a Business Exercise

Part One : The Use of Groups carrying out a Business Exercise .

Concurrent with the preliminary organisational studies , described in part one of section two , a more extensive use of the BTA Training Exercise was begun . The framework of this study was totally directed towards the model of group functioning described in section one . The preliminary studies with the BTA Exercise had shown that groups taking part in the exercise have a good many of the important characteristics of management groups in organisations . An intention in this second use of simulated groups to compare results obtained from the BTA Exercise with corresponding results from groups concerned with two other training simulations used within BEA . These were :

1. A variety of the Andlinger exercise [1] used for training more junior staff on approximately six courses every year . This is a comparitively simple exercise , requiring only a few important decisions .

and 2. A Production Management exercise used in non-residential Supervisory Development programmes . This exercise was a component part of the BTA exercise [2] which had been separated and modified to processed " by hand " rather than through batch computer processing .

The use of three sources of groups , with implicit differences in the tasks required of groups and separate group members , would make possible some investigations into the different structures required for dealing with different tasks .
As observation of the BTA Exercise was continued these two other sources of groups were examined for research use . The researcher also participated in " plays " of both these two tasks . Neither of these group sources was suitable for use in the present research . Some particular reasons were :

1. The populations taking part in two exercises were not directly comparable with those taking part in the BTA based courses . The career structure , for

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1. G. Andlinger op cit .
2. Made up of the activities identified in 5.12 as Production Requirement / Purchasing / Shipments .

example , made it unlikely that any staff going through these more junior courses would ever attend the BMS , AMS , and Inter-airline courses . For many staff the junior course seemed more a reward for many years of service than the objective based more senior courses . The environment in these courses was of relaxation rather than learning . On such courses the simulated decision-making exercise was frequently considered as the most flipant part of the weeks activity .

2. The staff administering the exercises was not constant and the briefing given to courses was not constant [1] . The exercise , in total , would last only a single day. Decisions about the length of each decision period were made by the director of the course . Groups were under a great deal of time pressure and many decision periods were shortened by the course director " to keep them on their toes " [2] . Under such conditions mistakes were common and often had permanent effects on the profitability of particular groups .

3. The groups carrying out these tasks in the exercises were generally smaller than the groups using the BTA exercise[3]. The task load per person was , however , less than in the BTA exercise . Even in decision periods which were planned to last less than fifteen minutes all major decisions could be made by a single person . Additionally , it was not practical in these two exercises to sub-devide and allocate sub-tasks to group members .

4. Unlike the stability found with groups playing the BTA Exercise , there were many fluctuations in the success of particular groups during time . In some cases this could be directly related to , either a gross clerical error or a change in the group member carrying out the " chairman " role .

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1. On all BTA based courses a single person briefed course members .
2. An attempt to maintain interest in the exercise amongst groups .
3. Usually four or five members in a group .

5. The influence of stochastic processes on the " market conditions " in the two exercises is much greater than that found in the BTA Exercise . The large random effects found for particularly courses would make a real comparison of profits in different invalid .

6. With such short decision periods it is not possible to carry out observer activity sampling studies for all three or four groups making up a course .

In summary , almost all the justifications for considering the BTA Exercise as a source for groups simulating real organisational groups were absent for these two further possible of group simulations [1] .

There is still a significant amount of research which can be carried out on the proposed model of group functioning - even using only a single complex group task . The specific loss is that it is not possible to examine the structure / activity and performance found for groups performing different total tasks .

This second series of studies was , therefore , consolidated around the known groups , with organisational group - like features , associated with the BTA Exercise . In the preliminary studies only the Basic Management Studies course (BMS) had been employed. These studies with all three sources of groups began in April 1966 and continued until October 1968 . During the early part of 1969 some further limited information was collected . Appendix 6.1 gives a list of all the courses used in this research . Code numbers are indicated (from 1 to 102) to facilitate reference in the report parts of this section . Data from the first nine groups used in the preliminary study was not used in the second study .

The 102 groups,from which data was collected for this second study , does not represent a single sample . Apart from the implicit differences caused by the three types of courses different material was collected in a series of distinct research phases . Only a few data items were available from

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1. Appendix 1.1 is relevant here . No attempt was made to introduce change in the courses - training programmes are fixed for approximately eighteen month periods .

all the 102 groups [1] . The phases in this study do represent a development in research interests , as the organisational study in real organisational management groups was planned . In particular , the methods planned for the organisational research were tried out whenever possible in the simulated groups . The method of activity sampling was considered to be of little use in examining the total activity of a real management group . During these studies with simulated groups the method of activity sampling was replaced , gradually , with self-report techniques .

It will be quite evident , from the lists of tests and forms which members were asked to complete during the research , that some change in the nature of the courses must be implicit in their use . Apart from such changes the courses were not altered during the duration of the collection of data period .

Appendix 6.6 lists the various sources of data used in this study . The appendices 6.2 and 6.3 contain the two extensive questionnaires developed . The following sections consider the collection of data in the three concepts of Group Membership Group Structure and Group Activity .

Group Membership

Before any person attended a BEA management course a detailed nomination procedure was carried out . This involved the manager's " boss " completing a nomination form . This was usually completed in the physical presence of the person being nominated for a training course . The information entered by nominators on this form was , in most cases , cases available from other organisational sources [2] . Except where some considerable time had elapsed between actual noimnation and attendance on a course , the data contained in this application form was almost completely accurate [3].

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1. This included the financial performance on the BTA Exercise .
2. Although BEA maintained a central personnel data file (both on cards and in electronic store) there were some other sources , for example , training records .
3. E. Abeles , BEA Research Fellow , carried out a validation study of a number of courses - by comparing the progress of course attenders with a matched group of non-attenders . He found the application form data the most reliable source .

Application forms were not completed with respect to participants in the Inter-airline exercise . Foreign airlines submitted the organisational titles of their group members [1] . But no information about age or length of organisational service was forthcoming . In a number of retuned application forms a few items perceived as confidential were left blank - this data was sought , whenever possible , during the week of the course .

BEA , in contrast to most commercial organisations , has some considerable expertise and experience in the use of a wide range of psychometric instruments [2]. Not only did they have staff qualified to administer and assess results but had , over many years before the research began , built up a substantial bank of test scores and various norms . As well as using tests on candidates for positions in BEA from other organisations , BEA had also requested testing for candidates for appointments when these candidates were already employed by BEA . The depth of testing within the company had reached a stage that , in a course of twenty , perhaps as many as five had been tested within the previous two years . The score norms which had been developed did not match the populations attending the training courses but they did provide invaluable information about which tests would be appropriate in terms of the administration and the ability to differentiate scores on the test . The following scores / tests were used during the research :

AH 5 A.Heim's test of General Intelligence

Cattel's 10 scale version of 16 PF Personality Inventory

Connolly Occupational Interest Questionnaire

and D. Pym' Attitude to Change Questionnaire [3] .

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1. Appendix 6.4 shows the lists of course members associated with three sample courses (BMS , AMS , and Inter-airline)
2. Apart from the instruments included in this research these included AH 4 , Birkbeck Tests (Occupation Psychology) B 1 - 6 , various tests of reasoning and Raven's Natrices .
3. D. Pym kindly agreed to the use of this questionnaire and provided a particular version for our use .

The reasons why these particular measures were selected , apart from their availability and known efficiency [1] in the research population , are the following :

1. AH 5 . This test [2], used often by BEA for selection and occupational guidance of staff , was known as providing a range of scores with the specific categories of staff taking part on BEA Management Courses . Studies within the airline had indicated that scores on the first part of AH 5 (as opposed to part two) did not appear strongly influenced by the mother tongue or cultural background of completers of the test [3] . Only this first part of the test was used during the various courses . The very large number of studies which have examined the mean and variance of group scores in General Intelligence [4] - especially in relation to the success of groups - made replication essential in this study .

2. 16 PF Inventory . This measure of personality characteristics was selected both for reasons of interest in specific variables contained within the profile and the wish to use a " commonly used and accepted " measure . It was planned to examine the mean scores and variance of particular factors in the inventory results for groups .

3. Connolly Occupational Interests Questionnaire . This was another questionnaire which had been used in both selection and occupational guidance in BEA . In the first study using BTA it had been observed that there was no apparent relationship between the usual

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1. Apart from the general use within BEA D.Kitchen and E.Abeles both carried out substantial studies in the period 1964 - 69
2. A.Heim AH 5 Test Description and norms . N.F.E.R.
3. A typical management course in BEA would contain between two and four members whose normal language was other than English . All these had a technical knowledge sufficient to follow the rather precise instructions in AH 5 part one .
4. However the frequent use of measures , like Binet and later derivatives , seems based more on availablity than expected relationships with activity and performance .

organisational occupation of participants in a course and the tasks they performed in the group . The use of the Connolly Questionnaire would provide a number of scales which would allow examination between member interests (as opposed to actual work performed) and the adopted tasks and performance of groups .

4. Pym's " flexibility " Measure . This extremely short test [1] , although not published in 1967 , seemed of especial appropriateness for psychometric determination of group members . For the majority of participants on BMS , AMS , and Inter-airline courses the BTA environment - of working in groups of up to nine people making concrete decisions - is quite novel . It might be expected that groups which adjust to this novel situation of intense group work best may be more successful in performance . Group members and total groups which are registered through Pym's measure as being more favourable to change may be those that achieve best results . The short version of the test , as used , is shown in appendix 6. 7 . The test , being less validated than the others employed , was administered , when feasible , both at the start and at the end of the respective courses .

Group Structure

There were three sources of data concerning the structure of the groups in the study . Observation Recording , as described in section two , was continued with few modifications . The third section on the observation scheme , concerned with the identification of material used , was discontinued . Apart from the observation records made , the main instruments from which structure measures were obtained were the Inter - Decision Questionnaire and the End - of - Exercise Questionnaire . These two documents , included as appendices 6.2 and 6.3 , are described below :

1. Inter-decision questionnaire . It is common practice to employ " evaluation questionnaires " in training courses and in between plays of business exercises to assess the value of the foregoing decision

1. In a final form this was reduced to a six item test .

period to the participants [1] . To some extent the questionnaire devloped does represent an attempt to combine this type of " morale " assessment with extracting more concrete data about developed group structure . In addition , the data obtained in this questionnaire is primarily " second-order " classified structural information [2] . In order to maintain the interest of group members [3] the questionnaire was kept as short as possible and was concerned with those aspects of structure that were known or expected to change during the existence of the group . Quite a number of specific questions were included to confirm the stability result found in the first study .

The form of the questionnaire used in the great majority of instances that shown in appendix 6.2 . Trials were carried out with a single tabulated sheet issued to each course member and completed after each decision period . This second method was found unsuitable in terms of the reliability of entry making .

2. End - of - Exercise Questionnaire . This was the main document from which " first - order " structural data about groups was obtained . Although designated the end-of-exercise questionnaire it was always given out at least two decision periods before the completion of the BTA Exercise . Completion of the questionnaire took up to twenty minutes . The details of the exact content of the questionnaire is given in later sections concerning the actual data obtained from its use . The main objective was to get each individual to separately construct a matrix of both the task and decision structures for the group as perceived by the individual. In order to accomplish this - and produce records which can be related to other records in the same and other groups - it is necessary to list both the categories of decision-making and the various tasks which

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1. See , for example , Warr , Rackham and Bird 1970 .
2. See page 50 for a definition of second-order structural features of task directed groups .
3. The questionnaire needs to be completed on up to eleven separate ocassions .

can exist in groups attempting the BTA Exercise . The lists of tasks were chosen so as to combine as much of the research recognised major task areas with task descriptions which would be meaningful to course participants [1] .

Group Activity

The activity recording form was not substantially revised although only sections dealing with the people involved in an episode and the purpose (according to the model of management decision-making and control activity) were used in this second study . Data about the topics of episodes , collected in the first study , had been of little direct use . Information about the particular task topics with which group members were concerned were obtained in this study through responses given in the end-of-exercise questionnaire .

The method of using the observation form , identifying what each individual was doing in the group in a sequence of observations , was retained . Influencing the decision to keep this system was its similarity , especially in terms of the unit of activity data collected , to the diary-recording method planned for later organisational group studies .

The preliminary research using the BTA Exercise had shown that groups achieved some kind of stability in structure and other characteristics in a period in the middle of the exercise . Observation recording was only carried out in these periods . One quite specific result of the earlier study had been the importance of the effect of the general spatial arrangement of group members on the frequency of recorded contact between particular pairs of group members. . An attempt was made to reduce the direct effect of the spatial structure adopted by groups . The briefing given to groups was extended to explain to group members how important both the arrangement of tables and the seating of individuals might be in effecting the effectiveness of their activities . An example of the " masking " effect was given .

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1. Compare the used list of twelve chosen sub-tasks making up the required task of the BTA Exercise (listed in appendix 6.3 page 3) with appendix 5.12 .

Sequence of Study using Simulation Groups

There were a number of phases during this research with groups using the BTA Exercise - some of which have already been referred to in this section . Appendix 6. 5 gives an overall schedule of the use of the various measuring instruments during the research period April 1966 - February 1969 . This sequence was not planned from the outset of the study . Each stage was dependent on the results obtained from the previous stage . The psychometric instruments , in particular , were not continued throughout the whole study because of the very limited relationships found between the results for these measures and other group variables , like structure , activity and success . The following sections give summary accounts of the separate stages in the study and the main investigations which took place at that time which determined the next research step . The remaining parts of section three , although generally corresponding to the development of research interests described below , contain many analyses which were only made towards the end of the whole simulation study .

1. Examination of the AMS Courses and Inter-airline Exercise .

   Between the period April and October 1966 there were no Basic Management Courses . Although three such courses had been available during the earlier BTA study it was known that only a further seven or eight courses of this type would take place before April 1968 when it was planned to begin an organisational group project . There was therefore a need to examine the two other other sources of groups and seek confirmation of their usefulness in the research . Nine Inter-airline groups and six Advanced Management groups were examined in the period April - October , 1966[1]. During this time observation studies were carried on [2] and more substantial record keeping

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1. Concurrent with the tracer study in Germany .
2. Observation recording was complete for all English speaking groups and some data was recorded (based on the researchers knowledge of the language) for German and Swedish/Danish speaking groups (five groups in total) .

of the financial success of groups was started . There was a great deal of evidence [1] that the structure , activity and success had many similarities with the corresponding characteristics found in the preliminary examination of the BMS groups . Towards the end of this period the end-of-exercise questionnaire was developed and was first administered in a trial with AMS Course 2 (September 1966) . Some psychometric data was collected through tests from this same course . A decision was made not to request members of airlines , other than British European Airways , to complete test material [2] .

2. First Use of Tests .

From December 1966 until October 1967 a total of five courses were tested with part one of AH 5 and the Pym Flexibility measure . The use of the end-of-exercise questionnaire was continued and the inter-decision questionnaire was developed and used regularly . Observation recording through activity sampling was carried out only with English speaking groups . Both tests were admistered on the first morning of the course , before groups had been formed for the BTA exercise . No control over the membership of particular groups , according to the scores obtained by individuals , was exercised These two tests were used so as not to change the content and load of work on the course for participants . The Pym questionnaire was administered again to all course participants at the end of the course .

3. Second Use of Tests .

The second battery of tests was used in the period between October 1967 and April 1968 [3] . At first

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1. Particularly the trends and basic stability of group success and patterns of activity within groups .
2. When Inter-airline groups requested testing (i.e. a BEA group was present in the course) tests were administered . Biographic information for these groups , through an application form , was not available .
3. E.Abeles and D.Kitchen assisted in test administration .

these two tests were administered during the first day of the respective courses . Experience showed , however , that not only was a considerable time required for the completing of these two inventories but that the time for individuals varied enormously . In later courses [1] the Connolly measure was given out and collected on the first day , while the 16 PF material was given out on the second day and collected at a later point in the week [2] .

The results of this programme of research in groups carrying out the BTA Exercise are given in the remaining chapters in this section of the thesis . Chapters first consider the data obtained within each of the main concepts of group functioning in the research model outlined in section one . Within each of these chapters the relationship between measures and specific results in that specific concept is also examined . These chapters are concerned with the following :

The Financial Success of Groups

Group Membership

Group Structure

and Group Activity

A final chapter considers relationships and correlations between specific measures obtained under different concept heads and draws some summary conclusions for the research .

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1. Courses BMS 20 and 21 , and after .

2. Usually on the third day .

Part Two

The Financial Success of Groups

The intention of this chapter of the thesis is to show that it is possible to obtain measures of the financial success of groups taking part in the BTA Business exercise which appear to be a true reflection of the effectiveness of the groups' decision-making . The data obtained is shown to be distributed normally - which renders the financial measures of use in investigating structural and activity correlations with degrees of financial success achieved in the simulated group task . There is no factor , implicit in the simulation design , which seems to limit , standardise , or distort the range of financial success which has been found for groups .

There were a number of unanswered questions remaining from the first study about the degree to which the cumulative profit represents the independent decision-making effectiveness of members of a group . The first extensive study carried out was an investigation of the cumulative profits , trends in profits during the exercise , in order to assess , statistically , how independent and stable the various measures of success for different groups are .

The existence of the three different types of courses in which the BTA Exercise was used , with implicit differences in the populations , made it necessary , in the first instance to consider the success data associated separately with these three populations . The success measures for the A M S , B M S and Interairline courses are shown in appendix 7.1 . There were some differences in the use of the BTA Exercise in these three different course types . A M S and B M S courses usually continued for twelve BTA periods [1] while eight or nine was more common for the shorter Interairline course . Although data was collected from all courses up to the last decision period it was expected [2] that the information relating to the last decision period would not be usable for analyses .

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1. Each " period " representing a month of airline operations
2. Because of the " end of exercise " policies adopted by many groups in the last period to maximise profit without reference to future , hypothetic , decisions .

The existence of important implicit differences in the membership of A M S , B M S , and Interairline groups meant that significant differences between the financial results for groups may indicate the importance of psychometric characteristics in determining the quality of group decision-making . However , a null result - that no substantial difference in patterns of profit associated with the three populations of groups with their different psychometric content , would be more conclusive . Psychometric differences in the membership of groups could be concluded as being unimportant in determining the quality of decision-making as identified through financial results .

Time Series Studies

There are two factors which can be expected to distort the patterns of financial success achieved by groups through the exercise . While the majority of costs and revenue are continuous in nature (any amount is possible) - this is not the case with the purchase of materials . Any order placed must be for a specific minimum amount and the month in which delivery is made , together with payment , is subject to stochastic process . Although the cumulative profit is adjusted for stock levels of materials some uneven effects on the final profit for a particular period can be caused by random arrival of new spare materials . The effect is primarily through the requirement of having to maintain cash reserves to pay for possible arrivals and sudden changes in the costs of holding stocks at different levels . A second , more important , effect on the changes of apparent profitability in the BTA Exercise is the delay between the investment in certain expenditure items , like marketing , and the actual effect of such " investment " on increased load factors , that is , increased profit .

However , the first studies using the BTA Exercise had indicated a stability of profit results associated with specific groups . Graphs of the changes in profit during the exercise were drawn for each course and examined . Profit or loss seemed to follow the the change in the total " product " market which had been programmed into the exercise . As in the earlier study there were few changes in the profit rank of a set of groups making a course . Groups which were doing well during

the early part of the exercise continue to do well in the later decision periods . But there was an apparent absence of a multiplier effect - groups were did well did not appear to be able to significantly better profits when faced with conditions later in the game which were identical with earlier situations . Similarly groups which did rather badly did not become significantly worse as the exercise continued . Unfortunately the exact size of the market at various stages in the game is a complex product of the results of the decisions made by all three groups making up a course and the programmed market growth and contraction in the simulation model . It is , therefore , not possible to standardise changes in profit during the game which would have allowed an index of profibility to be available for each group for each decision period in the use of the B T A Exercise .

Summary Financial data obtained from Groups .

Because of the problems of using time series data statistically and the identified randon effects of some apsects of the game design on profits for individual decision period results two summary figures were obtained from the results for all courses and groups . The total cumulative profit which had been obtained by the end of month eight , adjusted for stock-holding , was listed for all groups . The other financial data to be considered in detail was the result of the trial decision period Each course was allowed a " trial " decision period - after the completion of which the exercise was restarted at the first decision period again . It was policy not to inform group members that the trial decision was only a first attempt and that the profit or loss would not be carried forward to further decision periods . Unlike later decisions there is no possibility of a single large random effect on profitability for particular groups . It is possible to obtain for every group a measure of financial success at an early stage in the exercise which is historically independent of a later cumulative figure . Provided certain criteria as regards the nature of the two sets of financial data are met , an opportunity is provided to determine how much of the variability of the final figure of profit is related to an initial measure of profit .

The consistency of the pattern of profit through the exercise suggests that such a relationship between initial and cumulative profits does exist .

The first criterion which was examined was the need for the two measures of profit to approximate to a normal distribution . Some degree of skewness was expected in the data as , although there is , in theory , a maximum profit which can be obtained in the exercise , there is no limitation on the loss which can be incurred . Histograms were constructed for the frequencies of groups with specific profit results and are shown as appendix 7.2 . For both histograms N is 100 . The means and standard distributions , assuming a standard normal distribution , have been indicated . In both the resultant histograms there is a slight negative skew , as predicted . In other words , there is a slight excess of scores with higher profit than would have been predicted from assuming a normal distribution . The divergence from normality was considered small enough to warrant the use of this profit data for parametric statistical treatments .

A test of the null hypothesis , that the sets of profit records of groups do <u>not</u> appear to come from <u>different</u> populations of profits , strongly confirmed the proposition : -

	t	df	t needed for 0.1 p [1]
Initial Profit			
B M S - A M S	0.57	46	1.68
B M S - I A	0.83	58	1.67
Cumulative Profit Month 8			
B M S - A M S	1.11	46	1.68
B M S - I A	1.37	58	1.67

It is therefore possible to use the profit measures without restrictions on the source populations of the groups . This is an important result which enables the use of the total population of one hundred rather than three populations in the twenty / thirty range .

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1. A two - tailed test .

A more extensive examination of the relationship between the early and later success achieved by groups was carried out by a regression analysis of the cumulative profit at the end of month eight on the initial profit in the trial decision . Appendix 7.3 lists the data for the two variables , the parameters for the regression equation and the correlation coefficient . This correlation coefficient (0.783) is significant at well beyond the 0.001 level . 61.3 % of all the variation in the final month cumulative figure can be accounted for by the corresponding value of the trial decision profit [1] . This means that only 38.7 % of the variance in the final cumulative profit can be due to factors which are not associated with the first decision and its profit result .

Further regression analyses were carried out using the three separate sources of groups : A M S , B M S and Interairline . Appendices 4 , 5 and 6 give the variables , equation parameters and results of the regression analyses . The summary results of all the regression analyses are included below : -

	All Groups	B M S	A M S	Interairline
Number of pairs	99	24	24	35
Parameter A	2262	1766	2728	2609
Parameter B	3.54	4.18	2.56	3.12
Coefficient of Determination	0.613	0.662	0.503	0.618
Correlation Coefficient	0.783	0.814	0.709	0.786

All these correlation coefficients are significant at beyond the 0.001 level . A graphical representation of the regression for the total population is given as appendix 7.7 and the regression lines for all four populations are included as appendix 7.8 .

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1. If the correlation coefficient of y on x is r_{xy} then the coefficient of determination (the proportion of the variance of y which can be accounted for by x) is $(r_{xy})^2$.

This result provides confirmation of the earlier null hypothesis result : that the results obtained for the profit figures for the three implicit population sources of groups suggest that there is no significant effect of the implicit biographic and psychometric differences on success in the BTA Exercise . Agreement between the regressions is especially of note (see the graph in appendix 7.8) towards the mean and higher values of the variables which produced the slight excess of results . In order to study the possible non-homoscedasticity of scatter of entries in the regression analysis , a separate analysis was carried out for the deviation of actual Y values from the Y values predicted from the regression equation from the known values of X . Appendix 7.9 shows the resultant graph . There is visually a correspondence between the distributions of Y (actual minus regression predicted) over all ranges of the value of X - the initial profit on the trial decision . It is possible , therefore , to be confident about the predictions made from the regression analysis over all values of X-the profit measure for the trial decision period .

For a number of courses , accurate records of the continuing financial success were kept up to month twelve (A M S and B M S courses providing the majority of these) . A second regression analysis was carried out between the profit obtained at the end of month twelve on the profit at month eight . This was done for two reasons : -

1. From a purely statistical standpoint the relationship between the eigth and the twelfth profit should be greater than the relationship already found between the eigth and the trial result .
2. Observation of groups during the last few decisions has lead to the conclusion that change in the patterns of activity is particularly present in this period . This would , assuming that activity and decision effectiveness were related , result in a reduction of the expected determination of the month twelve cumulative profit by the value for month eight .

Appendix 7.10 gives a summary of the data used and appendix 7.11 the regression graph . The percentage of variation in month

twelve profit which can be accounted for by the value of the equivalent value of month eight is 6o.9 % . This is less (by 0.4 %) than the determination of month eight profit by the initial trial decision . This result supports the finding that the success of groups is constrained during the total BTA exercise but that the effect is less during the last few decision periods .

Effects between groups in the same course influencing Profit

The result that only 30 - 40 % of the variation in the final profit obtained by groups in the exercise can be due to factors not present by the end of the first decision period supports a hypothesis that profit Inter-action [1] cannot be an important determiner of the final absolute and relative success achieved . However , further statistical confirmation of the apparent absence of effect of different levels of profit within a particular course is not easy . The relationhips between the Initial profit and the Change in Profit [2] need investigation . An Analysis of Variance , considering each course of three component groups , investigated the within group variance compared with variance between groups . Variation between these two was that which could be expected from chance reasons alone [3] . Because of the possibilities of a complex effect the variation was examined graphically . For each course the highest initial group profit was identified and the remaining two profits were drawn against this profit figure . This was repeated for the Change in Profit data . The two graphs are shown as appendices 7.12 and 7.13 , respectively . There is a similarity between the two graphs . If the profit obtained by one group in a course is not related to the performance of the remaining two groups , then the financial performance of the other groups in the cours would be randomly distributed . A high degree of randomness

1. The degree to which the profit obtained by one group in a course is dependent on the relative success of the other two , competing , groups on the particular course .
2. These two abbreviations are adopted for the two prime success measures already defined .
3. 0.67 and 0.52 are the probabilities for Initial and Change in Profit measures .

does exist , as seen in these two graphs [1] . In particular , there is no restriction on the profit obtained by remaining groups when one group has either a high initial profit or has shown an advance in profitability during the exercise which is in excess of that expected from the regression equation prediction . There appears to be a very slight reverse trend - one group doing well seems to enhance the possibility of other groups on the same course doing well . This effect seems more pronounced for the change in profit analysis .

Other measures of Decision and BTA Success

Apart from the summary financial data up-dated after each decision period [2] another set of success data was presented to groups at the end of the total exercise . Sample data is shown as appendix 7.15 . Although primarily designed as an aid to finding out what went wrong in particular decision areas it was examined to see what use it could be as an additional or confirmatory measure of success . The examples shown in the summary are quite typical . While the majority of the cost indices correlate well with the final financial successachieved by groups there are some differences. In the example , team two has obtained the best profit but has only managed to secure the best cost figures on three of the indices produced (a total of eight) . There was evidence that those indices which were the concern of more than a single individual were most often in agreement with the final profit rank between the groups . It did appear that these indices would be of particular use in certain circumstances .

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1. This allows another statistical test of the Analysis of Variance between the three sources of groups . For each course the mean of the three groups' Initial profit and Change in profit (difference between actual and predicted cumulative profit) was calculated and a two-way analysis carried out . The result confirmed the earlier analysis . Only for the Inter-Airline population was there an approach to statistical significance ($p = 0.056$ by chance alone) . See appendix 7.14 for details of this analysis .
2. Exemplified in appendix 7.17 .

However , in the present research , the data was only obtained for a low number of groups and the members of these groups did not know that performance on the exercise would be assessed on these detailed cost analyses .

Summary

For groups taking part in the simulation BTA it is possible to produce two measures of success representing an initial and a later cumulative financial performance . These two measures are not logically related to each other . Financial success in the exercise for the three types of courses appears to be a genuine correlate of the groups' response , in the form of decisions , to the required tasks in the BTA Exercise . Both obtained measures [1] are distributed , approximately , normally and there is no significant difference in the means and distributions of the three sources of groups . Within specific courses there is an absence of mutual influence of profitability dispite competition for a market with distinct constraints . The two developed measures of success , the Initial Profit and the Change in Profit , contribute approximately sixty and forty percentage , respectively , of the variability in the Groups' cumulative profit at the end of the eighth decision period .

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1. The Change in Profit (the difference between the cumulative profit at the end of month eight and the cumulative profit predicted from a knowledge of the the initial profit) has been listed for all groups in appendix 7.16 .

Part Three

Measures of Group Membership

Like the last chapter , this section sets out to examine the characteristics of the membership variables which have been obtained for groups taking part in the Exercise . Included in this chapter is an examination of the relationship between certain psychometric and biographic measures and a study of the differences between the populations of the Basic Management Studies , the Advanced Management Studies and the Inter-airline course .

Biographic Information

All data entered on the Course Application Form was transcribed for use in correlational experiments . The information contained was adjusted so that ages , present job etc. was correct as of the first day of the course . The information listed for AMS and BMS courses was as follows :

Age

Organisational Title

Organisation Division or Department [1]

Management Salary Scale [2]

Length of service with BEA [3]

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1. The identification of particular people with specific BEA Divisions and Departments used the main distincts implicit in the structure shown in appendix 4.5 . A reorganisation of BEA took place towards the end of the research period using groups taking part in simulations . This , however , effected , at the date of the studies , only the titles given to departments . Units within departments were left intact .

2. The actual earnings were unavailable . Because of the large overlap on scales the organisational salary scale (as expressed in appendix 5.2) is not a good correlate of the actual financial rewards of BEA staff .

3. Service in the various precursors to British European Airways (Imperial Airways , B O A C , and British South American Airways) has not been included .

The remainder of this sub-section considers the results obtained with these biographic measures . Material from the Inter-airline groups was not available .

Age

The analysis of the age of group members was undertaken not only to characterise the individual groups but also to provide a means of examining the probable effects of age on the scores of a number of other biographic and (especially) psychometric variables [1] . The age data given and used in various analyses in the appendices to this chapter are obtained only from those groups where psychometric measurement has been undertaken .

A first analysis was of the distribution of age of group members both in BMS and AMS course populations , considered separately and together . Implicit in the design of the training courses in a total strategy of management development is that course AMS is for more " senior " managers than the BMS course . It was expected that there would be a significant difference between the ages found for the two course populations . Indeed a percentage of AMS course delegates had either been through an earlier version of BMS [2] or analogous courses which BMS had replaced . However an F test (analysis of variance method) indicated that there was a large probability of the actual difference between the two populations having occured by chance factors alone [3] . This concurrance of the BMS and AMS populations appears to be a partial consequence of the large and increasing total source populations for these two course populations . The total size of the eligible staff for the BMS course was more than three thousand - but it the newly promoted and younger staff in both course populations which tend to get nominated for management training programmes .

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1. See , for example , results for AH 5 and its correlation with age . A.Heim op cit . Similar results had been found in internal use of the AH 5 measure .
2. In the research period only a single member of an AMS had taken part in the BTA Exercise on an earlier BMS course .
3. Distributions had been found close to normality . Exact probability by chance alone was 0.89 .

The average age of staff attending the course [1] is less than the eligible population within the company [2] . The entry into courses of staff who have been newly promoted into the eligible population results in there being no increase in the average age of staff when attending the course during the three years in which studies were carried out .

Although the selection of course members into groups was decided by the administrators of the course and not a random process , the distribution of the age (mean age of courses) is compatible with a random selection process . A list of the mean ages found for the BMS and AMS groups , together with the appropriate standard deviations , is shown as appendix 8.13

Length of Service with BEA

Quite a number of research studies using specific tasks has employed the method of experienced groups contrasted with niaive groups . This has , typically , been in training environments where a validation of a learning simulation is attempted . Groups which have prior knowledge of the task which is being simulated should perform better on the simulation than inexperienced groups [3] . As BTA is extensively modeled on the European Air Transport Market in general , and BEA's operations in particular , it might be expected that staff who are more experienced (with longer service) will make more suitable decisions . Age matching in the BEA population would have presented a substantial problem if it had been possible to control the composition of groups .

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1. Appendix 8.1 gives the frequency histograms and the mean ages found for the two course populations AMS and BMS .
2. The difference is between three and four years . That is , the average age of eligible staff in the company between 1966 and 1969 was approximately 40 compared with 35.9 for the actual courses . Differences in mean length of service is greater .
3. See , for example , A. Spackman's (1967) research in Control networks of Departure at Airports .

BEA has had an uneven pattern of recruitment since its foundation in 1946 . Not only were a large number of staff directly transfered from the war-time BOAC organisation but in addition there was a considerable post-war recruitment of senior servicemen . Attrition of BEA staff , in normal circumstances , is very low indeed compared with most other industries [1] . The majority of staff who were employed or recruited by BEA during the period 1946 - 1950 were still employees at the time of this study . This distortion effect on the distribution of the age and length of service is not found within the course populations . A regression analysis of the length of service of staff against their current ages (appendix 8.2) produces a straight line . This result indicates that the average age that people have joined BEA has not significantly changed (considering the AMS and BMS populations as representative) over time . This correspondence of age and length of service means that it is not possible to separate the correlations these two may have with other group variables . Even if control over group membership had been exercised a very large sample of groups would have been necessary to test for statistical significance because of the high correlation between age and service length in BEA ($r = 0.78$ [2]) .

Organisational Title , Division in which Employed , and Salary Scale .

The titles given to staff i.e. Superintendent , Officer , Senior Officer and Supervisor , while implying differential status within the management units where the members worked , were not sufficiently subject to constant criteria to allow comparisons between members and courses Certain divisions were more ready to use " Senior " descriptions for supervisors and managers than others . Organisational " guidelines " and a single job evaluation

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1. An average " loss " of staff per month during the research period would be much less than 1 % . The lack of attrition was particularly notable with management and supervisory staff categories .
2. r is used to represent a Pearson Parametric Correlation coefficient in this research .

system were in use - but substantial anonomolies were recognised . No analyses using the type of organisational status implicit in the titles of course members were , as a consequence , carried out .

The organisation division or department in which each members usually worked was not subject to different interpretation . Unfortunately the mix of members attending each course as well as the individuals making up particular groups was manipulated by the administrators of the training programme to provide as much heterogeneity in members as to the department or division of origin . A typical BTA group might therefore contain one or two overseas-based staff , several from the operational divisions [1] , and a balance of Head Office administrative staff . As a result of the methods of choosing the content of courses and groups there was very little variation in the mix found for groups trying the BTA simulation .

The Management Salary Scale has already been characterised as being a very non-specific label of income due to the overlap of adjacent income scales . This would not be so important if the range of M - Scales for participants was considerable . However only three scales (M 1 , M 2 , and M 3) were applicable to just over 90 % of all BMS course attenders and two scales (M 3 and M 4) applicable to 70 % of managers on the AMS course . All real distinction between the salary obtained by different members of groups could , therefore only be got from a knowledge of the exact position of each member's position within his M Scale . This information was not available from organisational sources .

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1. Operation staff are those that are directly concerned with the " production " - like activities of the airline . Employees from Airport and Sales functions made up the majority of operational staff on courses .

First Series of Psychometric Measures [1]

The frequency distributions of the results of the use of these two measures (with a sample of 88 course members) is shown as appendix 8.4 . Both distributions are good approximations to normal distributions . This is to be expected in the case of the AH 5 test which has 36 items but the close approximation obtained from the use of the Pym flexibility measure , containing only six items [2] , is quite exceptional .

In this study the reliability of the AH 5 test has been assumed . Conditions in which the test was administered [3] were identical with the usual " group test " use of the measure in selection and occupational guidance . Due to the length of the test neither retesting or the use of the alternative form of the test was possible during the course . Only a small percentage of staff attending the course had actually attempted AH 5 on an earlier ocassion [4] .

The repetition of the Pym measure was carried out as a first attempt at gauging the reliability of the measure and the scores obtained . Appendix 8.5 gives the regression of the score on the first administration compared with the scores obtained on the second administration . The reliability coefficient of the Pym measure - as used in the course situation - is 0.836 (N is 47) . This is statistically significant at beyond the 0.001 level of probability .

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1. Results are summarised in appendix 8.3
2. Pym's original questionnaire had been reduced to six items as these contributed the bulk of the variance . An item analysis was carried out on the measure as used . Single peaked , although skewed distributions were obtained for each item .
3. All staff administering the test were experienced in its use . S.B. Tribe , E. Abeles , and D. Kitchen - all Research Fellows at BEA Research Unit .
4. The main use of AH 5 within BEA had been for guidance in filling senior management posts (outside the range of those eligible for these courses) . AH 4 and the Birkbeck tests had been more frequently used in the M 1 - M 5 range .

The standard error of obtained score (Pym Flexibility) is 1.60 [1]. To ensure , therefore , that an obtained score represents the true score [2] a range of ± 4 should be included when quoting the Pym result . However , the Pym measure is quite reliable from this result , given the low number of items making up the test .

Both the AH 5 and the Pym Flexibility measures were tested for association with the age of members of the populations . Both general intelligence and attitudes to change measures have been shown to be highly negatively correlated with the increasing age of those measured . The graphs in appendix 8.6 and 8.7 give the regression tables of AH 5 and the Pym Flexibility score , respectively , against the age of members of the course population . The correlation coefficient of AH 5 against age is - 0.34 which is significant beyond a probability of 0.01 [3]. However only 10 % of the variance in AH 5 scores can be related directly to the actual age of the person completing the test . The relationship of age and the results of the Pym measure is less . The equivalent correlation coefficient is - 0.238 which is just statistically significant at the 0.05 level [4] . In this case less than 6 % of the variation in the score on the Pym measure can be predicted from a knowledge of member's age .

Differences between Populations and Groups

A relationship between the age of group members and their score on AH 5 and the Pym measure has been established . In carrying out further studies the general negative correlation with age has to be allowed for . A first examination was for difference in the scores found for both measures of the two populations of courses (AMS and BMS) . The mean score on AH 5 part one , for the BMS courses , was 14.6 . The result

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1. Standard Deviation of test scores (n is 88) is 3.85 .
2. To a probability of greater than 0.95 .
3. For df = 85 , a value of r (product - moment correlation) must be greater than 0.275 for statistical significance at the 0.01 probability level .
4. For df = 85 , a corresponding r value of 0.21 is needed for the 0.05 probability level .

for AMS course population was 15.9 . A two-tailed difference of means t - test (with adjustment due to the known age / AH 5 correlation and the difference in mean ages in the two sub-populations) produced a t value of 1.71 . This result indicates significance at the 0.10 level . There appears to be some difference (in an expected direction) between the general intelligence of the two sub-populations making up groups attempting the BTA exercise .

A corresponding examination of the Pym scores in the two populations produced a result that means and distributions of scores in the two populations were almost identical .

The method used to select groups in courses would preclude any gross variation in the mean scores of AH 5 , Pym measure , or any other measure associated with specific groups . The collected means and standard deviations for these two measures for every group are shown as appendices 8.8 and 8.9 . An Analysis of Variance [1] for sources of variation in these two test score arrays indicated that results were consistent with chance selection of both measures from a constant population .

Second Series of Psychometric Measures

Appendix 8.10 gives an example of the scheme of data obtained from the use of 16 PF and the Connolly Occupational Interest Questionnaire [2] . One course (BMS course no. 23) is illustrated and the data from the three separate groups has been differentiated . In the period during which this data was collected, preliminary tests of the relationships between all 16 items in the 16 PF and all 7 items in the Connolly Inventory with the structure , activity and performance of groups were carried out . In this analysis only 6 items have been included as of being of specific relevance to the developed model of group functioning . These items were :

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1. Treating the AH 5 scores as belonging to two populations .
2. This data was collected jointly with D. Kitchen , BEA Research Fellow , Department of Occupational Psychology , Birkbeck College . It is his intention to use the results of the tests in an extensive validation exercise of the BMS course using a longitudinal performance method .

16 PF

Factor	B	General Intelligence
Composite Factor	Q_1	Conservatism
Composite Factor	Q_2	Group Dependent

Connolly Occupational Interests Questionnaire

Item	F	Social
Item	G	Perserverant
Item	K	Clerical

The scores on these items for each individual in the twelve groups which were tested are listed in appendix 8.11 . As is usual with the application of such lengthy questionnaires there were null returns . The approximation to normality of the final adjusted scores [1] was tested because of the special nature of the population and the use of a smallish sample . The frequency tables in appendix 8.12 gives the distribution of the sten scores and percentiles from the 16 PF and Connolly Inventories , respectively . Normality in sten distributions is represented by a normal curve but in the percentile distribution by a " flat " curve .[2] Only with the frequency for the B factor of 16 PF is there some deviation from normality . The direction of skew supports the use of the high grade AH 5 test on the course populations . Some skewness is present in all the Connolly items but the range in scores is sufficient to distinguish between individuals . The reliability of these two questionnaires has been assumed for the purposes of this research [3].

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1. With such small samples there is a great benefit in being able to assume parametric data and associated statistical methods .
2. Each 10 % unit in the percentile histogram should contain 10 % of the total number of scores . Normality is assumed in the derivation of percentiles .
3. A repetition of such questionnaires not being feasible in a short course .

Correlations with other Biographic and Psychometric measures

Relationships which might be significant for this study were tested . The scores on AH 5 and the B[1] (intelligence) factor were obvious in accordance statistically and a negative effect of increasing age on the B factor score found . The relationship between age and this 16 PF factor was of the same order as that found between age and AH 5 .

Age and intelligence scores were related to the remaining five items in this second psychometric exercise and tests for correlations were made . No correlation beyond the range ± 0.15 was found , that is , no degree of statistical significance .

1. Some doubt has been expressed about the B scale of 16.PF as a general intelligence factor . See O. Buros (1972) - section on 16.PF

Part Four

Structural Descriptions of Groups taking part in the BTA Exercise .

The two main questionnaires used to identify the structure associated with particular groups contained a number of questions which were not specifically directed towards the description of the first - order structural characteristics of the group . Before the main structural descriptions and results of measures are presented in this chapter secondary structural questions - generally concerned with the stability of groups' structure and activity as perceived by the members of a group - are considered .

The Inter-decision period Questionnaire . The major purpose of this questionnaire was to confirm the finding from the earlier BTA study that stability in structure is achieved in the first few decision periods . Appendices 9.1 to 9.11 summarise the results found by the use of the non-tabular questionnaire [1] . For the greater number of analysis only three or four [2] of the total of eight or twelve decision periods (depending on the type of course) have been displayed in a tabular form . A feature of the total record month-by-month outside the sample of months chosen for the tables was the absence of discontinuous changes .

Before detailed results were examined a special study was made of the apparent effect of the size of groups on structural measures . Earlier evidence in the first use of BTA had suggested that size was not a structural characteristic of unique importance . Further studies were , however , undertaken to assess the dependence of some measures obtained on the actual total number in groups [3] . The first analysis was a graphical display of the mean number of tasks associated with members of a group compared with the size of

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1. This questionnaire has been included as appendix 6.2 .
2. For courses containing 8 decision periods months 1 , 4 , and 7 were identified . The corresponding months for the longer 12 decision period courses were 1 , 4 , 7 , and 10 .
3. The results found and described later in this section were dependent for their validity on the results presented here .

that group [1] . There is no indication of a decline in the number of mean tasks carried out as the size of groups increases . This does , however , imply that as group size increases , the average number of people carrying out a particular task must decrease in direct proportion to the increase in group size . A similar effect of group size was tested for with the type of decision-making found in groups . As the size of groups increases a reduction in " group " decision-making might be expected with an increase in decision -making which is carried out by individuals . Appendix 9.13 contains data obtained from an earlier appendix with groups arranged in a table according to group size . There is , visually , no significant change in the mean type of decision -making found for all group tasks which is occasioned by the size of the group .

With this confirmation of nogross effect of size on two important characteristics of group structure studies other studies of structural characteristics of the group were undertaken without special need to distinguish between sub populations of groups with four , five and other specified numbers of group members .

The inter-decision period questionnaire results are considered in the sequence of the question content .

Question 3 [2]

While the members of the groups perceive themselves as being very busy during the first decision period [3] the median response in the forth and seventh months , for both the short and long course populations , becomes the busy category . The stability which exists between the fourth and the seventh period is not continued in the last recorded period for the longer courses . A not very busy response is registered as the median . There is confirmation of a null hypothesis that the differences found for the two set of results for the short and long courses are consistent with chance reasons .

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1. Shown as appendix 9.12
2. " How busy , in general , have you been during the last decision period ? " .
3. 87.5 % and 86.3 % for the 8 and 12 month course groups , respectively .

These results indicate that the simulation requires , at least until the ninth decision period for an average group , a considerable involvement by group members . An additional analysis of the differences between the responses for particular groups , considering especiallythe size of the group of origin , failed to indicate any source of real difference between groups . Only for groups containing four or five members at one extreme , and eight members at the other end of the range , was there some evidence of increased and reduced workloads , respectively .

Question 4 [1]

Even during the first decision period about half [2] of all participants in the exercise know what is expected of them and only a few are quite unsure of the expectations of others in their group . A maximum figure of around seventy per cent. is reached during the exercise and there is a significant proportion of people who maintain their response in the intermediate positions in giving answers to the question . Differences between the eight and twelve month group populations are small enough to be consistent with chance . The high initial knowledge of what is expected in the group of particular group members is a result of the earlier trial decision which tends to identify sources of ambiguity in both task differentiation and task allocation . Once the initial task structure has been set in the first few decision periods there appears to be little further clarification of the known expectations of others . For groups which continue to use the exercise up to the twelth month there appears a growth in the uncertainty in response to this question .

Question 5 [3]

This general question was designed in an attempt to get participants' views on the degree of internal conflict during each decision period . The question had been formulated to

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1. Results shown in Appendix 9.2 . " Have you been quite sure what the other members of the syndicate expected of you during the last decision period . "
2. 52.5 % and 48.2 % for 8 and 12 month groups , respectively .
3. Appendix 9.3 . " Have there been any periods during the last period which were not conducive to good decision-making feuding between group members etc. "

be meaningful to course participants rather than to present a specific definition of what was meant by the words " feuding " etc. The first study using the BTA exercise had shown , through the results of observation and observation analysis recording , group " conflict " phenomena did not take place in the training use of this simulation . In this second study confirmation was forthcoming through the actual level of internal dispute entered in this question . The more common periods for dispute were at the very start of the exercise and towards the end of the longer courses . Responses from the members making up a particular group were not consistent . On a number of occasions all four category responses had been indicated in the replies from a group for a specific decision period .

Questions 6 [1] and 7 [2]

A clear trend in the identified level of work through the use of the BTA exercise is discernable from the responses to question 6 . The distribution becomes more even through all the decision periods .

When the reasons for this distribution are examined (Qu 7) there are three . During the first few periods there were a number of written - in comments to the effect that the existence of the deadline time for the completion of the decisions was the main reason why they had been so busy during the later part of each decision period . In the three categories in which entries were made there were distinct changes through the play of the exercise . It is not possible to relate these to the changes seen in the records for question 6 as the direction of effect cannot , in two of the cases , be judged . The dependence on other people's work , which would have a tendency to delay activity until later in a decision period , was the most commonly assessed reason for the pattern of workload . The frequency of this response ,

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1. Appendix 9.4 . " How has your work been distributed in effort between receiving the simulation print-outs from the previous month and the completion of the decision forms for this month . "

2. Appendix 9.5 . " Do you consider this distribution (that identified in question 6) to be due to .... ? "

like all the frequencies , fell considerably during the exercise . The existence of decision-making and activity phases during each decision period has considerable effect on the nature and relevance of any method of sampling activity or ascribing a single stable structural description to a group .

The possible effect of an individual's work on the work of others in the group was studied by a separate treatment of the results . In the exercise there is a logical relationship built-in to the required decisions in the simulated airline operations [1] . There is a corresponding implicit chronological sequence of activity required in actual decision periods . Two activities were selected which appeared to be most likely performed at the start and end of individual decision periods . These two activities were those of deciding frequencies and of making spare part shipments to various stations . Appendix 9.6 gives the itemised response for question 6 for those group members who performed either [2] of these two differentiated activities . Although small differences do exist between the respective patterns , these are only statistically significant in the first decision period response . This is partly due to the fact that each individual in groups is , in practice , concerned with a number of tasks . But the change after month one may be due to participants in the exercise , even if a final decision can only be made at the conclusion of a decision period , becoming more able to carry out preparatory work on decisions as the game progresses .

There is no pattern in the response obtained for question 7 about the reasons for the distribution of the workload they have identified in question 6 which relates to the specific tasks which are being carried out by these group members .

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1. As indicated in appendix 5.12 .

2. As one of the total number of tasks which they might be carrying out by themselves or in collaboration with other individuals in the group . No group member was carrying out both itemised tasks .

Question 8 [1]

This analysis of the results of this question indicates that group members have a rather slower learning about the details of making decisions than the designers of the game expected . The purpose of the trial decision was to remove from the exercise proper special effects which difficulties in groups' assimilation of the structure of the exercise might have on group performance . By the end of month seven , the penultimate decision period for most groups studied , only 12 % of the participants in all groups say they have a complete knowledge of the tasks they carry out in the group . At the same time almost 15 % are still registering their knowledge as only fair or poor . This suggests that one of the reasons that group structure is stable is because members are still clarifying their own role in the exercise and decision process as implied in the original allocation of tasks to various members . The maintenance of interest in the exercise during a week of concentrated activity is also perhaps a direct result of the continuing demands made on the ability of members .

There is no clear distinction between the responses for individuals deaaling with different tasks , apart from a general relationship between the number of tasks that a member is concerned with and the speed with which responses to this question indicate a learning is taking place . There is no relationship between the number of people in a group and the rate of learning about the range of allocated tasks [2] .

Questions 9 and 10 [3]

For these two questions obtained responses have been charted over seven and eleven months of the two group sources.

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1. Appendix 9.7 . " What is the extent of your knowledge of the details of the tasks with which you are concerned . "
2. In smaller groups more tasks tend to be shared (see appendix 9.12) which masks any effect here .
3. Appendix 9.8 considers both questions . " Would you like to be doing (more / less) work at this stage in the exercise. " " Would you to spend (more / less) time doing your tasks in the group at this stage . "

Although designed to be complementary there is no doubt that the questions 9 and 10 did produce some confusion amongst completers of the inter-decision period questionnaire . Members of groups found it difficult to separate the level of work demand and the time required to perform actual allocated tasks . However , apart from a few written comments registering this difficulty , the results from the two questions are suggestive of a constant interpretation and the two sets of responses seem to support each other . Early in the exercise group members would like to be performing less tasks and,additionally , would like to spend more time on the tasks they have to perform . The trends for both response frequencies are similar . Only in the ninth and subsequent sessions do the responses indicate a requirement for more work and less time spent on given tasks .

Question 11 [1]

The pattern obtained for this question is in agreement with the conclusion reached from the corresponding pattern of replies to question 8 . In spite of extensive efforts to teach course participants the details of the BTA exercise a lack of comprehensive knowledge exists until very late in the use of the exercise with each course . Knowledge about the tasks of others is much less than the recognised knowledge about the group member's own task(s) . 84 % of the participants in the longer BTA Exercise still classify their knowledge of other peoples' task activities as being only adequate late in the exercise .

Question 12 [2]

It was expected that the answers to this question would depend on the actual number of people in the group of the respondents . Although there was identified a slightly higher requirement for extra group members in smaller groups this was not at a level of statistical significance .

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1. Shown as appendix 9.9 ."What is the extent of your total knowledge about the range of task activities which are being undertaken by your partners in the group. "
2. Appendix 9.10 . " At this stage in the Airline simulation exercise do you think that the group would be more effective if you had a different total number in your group . "

In any one course the difference between the size of groups would be not more than a single person [1] . Groups were not made aware that the range of group sizes which had taken part in the BTA Exercise was as wide as from four to nine group members . This knowledge would probably have increased the likelyhood of a group identifying its major problem as a matter of its size compared with other reasons .

The pattern of response through the exercise was of high initial demand for additional group members followed by a reversal later in the exercise (usually around the seventh and eighth months) . Three groups had the experience of the loss of a group member [2] . In these cases the responses indicated an immediate felt need for additional manpower in the group .

Question 13 [3]

The structure of replies to this last question in the inter-decision questionnaire clearly indicates that the response is only a measure of the individual's perception of the group in which he is working . In only three groups , amongst the five least successful in performance , was there consistency between the responses of different members of the same group . Generally the distribution of replies was that predictable from a knowledge of the total population and selecting responses without reference to the group of origin . There is a consistent difference [4] between the scores obtained in the seventh month for the short and long course types . At this stage in the exercise both sets of groups are aware of the total length of the BTA exercise . Groups in the longer course who are not performing well in the exercise indicate a reduced level of " morale " which actually increases during the final few decision periods .

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1. Although the allocation of course members into specific groups was planned sometime before the start of the course , last minute changes always took place . These changes were such as to minimise the size difference between groups .
2. Mostly through sickness and operational demands in BEA .
3. Appendix 9.11 . " The general 'morale' of your syndicate at this stage in the exercise is ... "
4. t - test : significant at 0.05 confidence level .

Data from the Inter-Decision Period Questionnaire :

A Summary .

The most important conclusion to be drawn from the Inter -decision period questionnaire of specific relevance to the research is the lack of inter-relationship between responses from the members of the same group . The second - order structural measures appear to indicate individual perception and reaction to the BTA Exercise as a set of required tasks rather than representing a common group experience with norms in responses to questions . The data obtained also shows that the perceptions of individuals about the BTA simulation and required sub-tasks are , in general , comparitively stable over the duration of the exercise .

Specific results for measures support the idea that the exercise presents a real demand on the ability and involvement of individuals in groups of varied size . Change present in the last few decision periods for the longer courses are large compared with earlier changes . This result confirms the atypical nature of these last decision periods already found in other connections [1] . The results obtained for the longer and shorter courses up to month seven are sufficiently in agreement not to exclude the joint consideration of these populations for other structural measures .

Post BTA Questionnaire

This second questionnaire , primarily designed to identify the first - order structural description of groups , contained four questions[2] which sought to clarify more secondary structural information about groups . The results are again considered in the strict order in which they were included in the questionnaire .

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1. Particularly the structure and activity results in the preliminary study of BTA described in section two and the financial performance trends through the exercise included in part two of this section .
2. Questions 6 , 7 , 8 , and 9 .

Questions 6 [1] and 7 [2]

Mean responses obtained for these two questions about the perception of " own " and " other " groups' success were different . The distribution for self-rating of success is substantially further towards the favourable end of the scale than the corresponding distribution of " other " group rating [3] . There was a much greater similarity in the responses from members of a particular group than with the answers found in the inter-decision period instrument . This is illustrated by the high correlations obtained between a regression of the category of individual response with the recognised financial success of the group to which the individual belonged . Appendices 9.15 and 9.16 give regression tables for the two separate questions . Correlation of the subjective assessment of success was greater with the measure of Initial Success (profit earned in the trial decision period) than with the final profit which the groups had available at the time at which the questionnaire was completed . Individuals (and groups) seem to make concrete their concepts of success at an early stage in the exercise .

The apparent over-estimation of the success of the responders' group is further clarified by the regression tables . The straight-line distribution for the assessment of other groups contrasts with the distorted distribution of the imagined success of own group when compared with actual financial performance .

Questions 8 [4] and 9 [5]

These two questions were designed to be virtually identical , but , through precise wording , would encourage the identification of factors which separately contributed to success

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1. " How successful do you think your syndicate has been . "
2. " How successful do you think the other two groups in this course have been. "
3. Appendix 9.14 gives the response histograms .
4. Appendix 9.17 . " What do you think was the reason for your financial success . "
5. Appendix 9.18 . " What contributed to your syndicate not doing as well as it might have done in the exercise . "

and comparitive failure . However , the wording in the questionnaire was not very satisfactory and confused a number of course participants . Substantial differences exist between the replies to the two questions - some of these may be due to the lack of symmetry and the lack of a clear distinction between good and bad in the questions .

A secondary analysis grouped the responses for individuals for both questions according to the particular pair of selections made in the answers . This is shown as appendix 9.19 .

The actual composition of the group (in terms of the abilities of members) was judged as a reason for group success - although almost a half of all group members did not feel confident enough to make a choice . Many more were able to make a decision as to whether the same factor influenced comparitive failure [1] . There was no difference in the occurance of specific replies which was common to particular groups . A examination of the patterns of response to this factor by individuals [2] indicates that the largest group of course participants [3] thought that the capabilities of group members had assisted success but that lack of success generally could not be attributed to these same characteristics .

Factor two , the importance of the structure of task and responsibility allocation , was also treated differently in respect to the two questions by completers . While the great majority indicated that it was a factor which assisted the group's success ,a similar majority thought the structure adopted could not be held responsible for lack of success . This effect is not , however , caused by the same people replying differently to these two questions . Indeed , the largest group in appendix 9.19 is made up of those who , while agreeing that it is a factor determining success ,

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1. There was a majority of two to one in favour of it being an unimportant factor .
2. Appendix 9.19 page 1 .
3. Made up of 61 course members .

also indicate that it did not influence the lack of total success .

" The actions of your Chairman " - the third proposed effect on profit or absence of profit - was the least popular selected reason . In a number of groups there was no absolutely recognised chairman function carried out by any one person or by anyone . Slightly more than ten per cent. of the course participants think that the actions of the chairman was a factor contributing to success . As with other factors this response is not limited to particular groups . A greater percentage of people think that the actions of the chairman have resulted in the group doing less well than was possible .[1]

The final category included," Co-ordination of the various group tasks ", was the most frequent reason produced by group members for the success of their group . Again there is an interesting inconsistency in less than half as many consider it may have detracted from possible further success . But in this case the efect is due more to a low response to the second question[2]- only twelve percent. of respondents changed from a positive answer to the first question to a contradicting answer to the second question .

This concludes the consideration of the secondary structural data obtained from the use of the two questionnaires completed by attenders of the BEA courses in which the BTA Exercise was used . The remaining sections of this chapter describe the derivation of first-order structural measures of groups from the Post - Business Exercise Questionnaire and the preliminary use made of the information relating to the task and decision-making structure of groups .

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1. 62 people consider that profit has been reduced (" not doing as well as it might have done ") compared with 20 who considered that the actions of the Chairman contributed towards financial success .

2. Only 37 .

Specification of the Structure of Groups concerned with the BTA Exercise .

The questionnaire which provide the structural data about the groups' attempts to complete the tasks implicit in the BTA exercise was satisfactorily completed as described in the first chapter in this section of the thesis . For a single group [1] there was evidence of gross discussion about the questions with much resultant agreement in the returned questionnaires . Data from this group has only be used in a limited manner .

Questions four and five in the questionnaire were designed to obtain a complete specification of the tasks carried out by individuals and the type of decision-making process associated with each of the itemised tasks . Summary sheets covering the responses of total groups were , in the first instance , prepared for every group . Appendix 9.20 describes the way in which this information was abstracted and summarised . Included is an example of the summary sheet which covered the questionnaires questions 4 and 5 for all members of group 55 [2] . Each summary sheet contains the task structure of the group built up from the collated perceptions of each individual about his own tasks in the exercise and his perceptions of the tasks of others in the group . A study was undertaken in those groups where observation recording had been continued . Questions were asked and observations of the apparent structure were collected during the run of the exercise . In the five groups studied at some length it was found that the first summary produced in analysis of question four was a realistic representation of the task structure separately identified by the observer . It was not possible to further continue these comparitive studies and in the remainder of the analyses using this data about structure derived from perceptions of individuals has been assumed as being the actual task structure of groups .

The material collected by the observer during the five studies referred to above also served to confirm the in-

1. This group was the only group used during the study with only four members .
2. See appendix 6.1 for a guide to group reference numbers .

accuracy of the task structure description which was assembled on the basis of the perceptions of the tasks carried out by others . This is to be expected when the answers to question 11 on the inter-decision period questionnaire are examined [1] . The difference which exists between the " correct " pattern of task structure in the group and the second pattern built up from perceptions of others' tasks provides a measure of how accurately the group was cogniscent of its actual total task structure .[2]

The final summary prepared for each group was the listing , for every group member , of the type of decision-making he thought the group was carrying out in each of the various tasks required in the group . The material was entered with respect to the various tasks in the list and totals of the numbers of each decision type identified by all group members over all itemised tasks were produced .

From the summary sheets the following further data was obtained and subject to analysis :

1. Number of members carrying out each task in Groups

A graphical representation of the number of individuals in each group who have been identified as taking part in every single task was constructed for each group . These figures (shown in appendix 9.22) were arranged in sets of groups according to the total number of group members . The " profile " of task-sharing varied very considerably between the 39 groups which were examined . Apart from the construction of these profiles of numbers engaged on particular tasks , the mean number of group members engaged on a task , without specifying which task , was calculated [3] .

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1. Only 15.4 % and 16.0 % had registered their knowledge of the task activities of others as complete or good .
2. An extensive analysis of the apparent " errors " in the perceptions of the task carried out by others is included in appendix 9.21.
3. Appendix 9.23.

Two further analyses were carried out with data relating to the tasks carried out by individuals in groups . The first was an examination of the mean number of people associated with each of the fifteen tasks which are required in the BTA Exercise . The figure in appendix 9.24 shows the mean number of people (and associated standard deviation) who were identified with each separate task making up the exercise . Apart from tasks 8 to 13 and tasks 5 to 7 all differences between the means cannot be attributed to chance variation . A second analysis considered the range of the number of tasks that individuals in a particular group were concerned with . Significant differences are found for the range of tasks carried on in different groups by members even when comparisons are only made between groups having the small number of members .

2. Type of Decision-making associated with Tasks .

A summary was prepared [1] giving the total frequencies within each group of each of the four categories of decision-making [2] entered by group members by each of the fifteen listed BTA tasks . Substantial differences exist between the summaries obtained for different groups and there is a consistent pattern of response from particular groups . A related table was constructed [3] showing the total number of categories identified by all members of all groups for each of the listed fifteen tasks . Further differences exist between the frequency of categories between the various tasks . However , this difference represents not only variance in the actual number of members in groups but also the general response rate for the questionnaire and specific

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1. Appendix 9.25 .
2. Decision category types are :
   - A. Only those concerned with tasks .
   - B. By these people together with others .
   - C. By the whole group working together .
   - D. By individuals in the group who have not been concerned with the activities related to the task .
3. Appendix 9.26 .

question items . In an attempt to remove the problems associated with this original data , second profiles representing the median group response for each separate task in the groups were constructed . In the tables of group decision-making found for the various tasks [1] , three , additional , intermediate positions have been introduced between the four listed decision-making types . This was justified by the fact that a number of group members did , in the completion of the post-exercise questionnaire , indicated a position between two of the printed categories . In addition , and of more importance , the responses obtained [2] from individuals supported the idea that the supplied four categories represented four fixed points in a decision-making type dimension . Tables were prepared which summarise these median positions both within groups [3] and within the fifteen listed tasks [4] .

Analyses of variance were carried out with these two sets of derived data in an attempt to confirm the expected significance of patterns of response from particular groups and in relation to specific tasks . A one-way analysis of variance was carried out with a sample of seven groups from the total population [5]. An F value of 12.7 , indicating a high level of confidence for statistical significance , was obtained for variance within decision-making categories [6] . Detailed t tests between individual pairs of groups were not carried out . However , even in the sample of seven groups , there were some pairs without statistically significant difference .

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1. Appendix 9.27 .
2. Both individual and results for total groups gave single peaked distributions .
3. Appendix 9.28 .
4. Appendix 9.29 .
5. Groups 33 , 48 , 58 , 59 , 100 , 101 , and 102 were used .
6. F value needed for significance at the 0.01 level (df 30 / 4) is 4.02 .

The second analysis of variance exercise , considering variance between listed tasks , for all groups produced an F value of 15.4 . This figure is , again , highly statistically significant [1] . Differences in the category of decision-making predominating with different tasks is significant in spite of the other effect of the group of origin . A series of t - tests showed that between tasks 9 , 10 , 11 , 12 , and 13 [2] there was no difference of statistical significant proportions .

The two sets of data derived from the post-exercise questionnaire , relating to the numbers of tasks carried out by individuals [3] and the characteristics of the decision making for each task , were expected to be positively related to each other . The more people that were concerned with a particular task the greater is the number that is likely to be involved in the decision-making process . Although the actual totals of people involved with decisions has not been developed , the dimension of decision-making type produced implicitly includes an increase in numbers from category one to category five .

A contingency table [4] was constructed using the two variables of the numbers involved on each task with each group and the median decision-making category entered by the group for the relevant task . The chi-squared value [5] computed from the contingency coefficient is highly statistically significant .

This result is important . It confirms that a predicted association between the actual allocation of tasks to members and the type of decision-making actually used in relation to tasks . It also confirms the meaning of the

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1. Value of F needed (df are 70 / 4) for 0.01 level of confidence is 3.60 .
2. These five tasks in the exercise are closely related .
3. Or the number of people in groups carrying out each task .
4. Included as appendix 9.30 .
5. Chi-squared value is 146.44 . Critical value of chi-squared (df is 16) is 39.29 at 0.01 level .

of the decision-making dimension and the general validity of the sets of data obtained from the main structure questions in the post-exercise questionnaire .

A further test of the relationship between the data relating to the task structure and the decision structure was carried out with the data summarising these measures for groups . A rank order test was carried out with the distributions of decision-making over all fifteen tasks . This rank order , representing the average type of decision making over all group tasks , was correlated against the corresponding rank order of groups according to the mean number of tasks carried out by group members . A positive correlation was obtained [1] , but this was not at a level of statistical significance .

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1. Rho correlation coefficient is 0.307 (28 df) . 0.361 is necessary for significance at the 0.05 level . A reduced correlation , compared with the consideration of individual tasks , is to be expected in the use of the group summary data .

Part Five

Recorded Group Activity

Unlike the methods which were used in the earlier chapters describing other group concepts , the method of observation recording had been used in the preliminary research using the BTA exercise as a basis for a group task . Data and results which are summarised in this section relate to the activities of individuals and groups over the whole period during which observation analysis and recording was carried out . No further time-series analyses of the changes occuring during the use of the exercise by in groups was carried out as the results in the first study had demonstrated the stability of activity characteristics of groups .

As the studies were carried out statistical tests were used to ensure that the procedure adopted to eliminate the isolated effect of the spatial arrangement of group members on patterns of contact between individuals . The procedure outlined was satisfactory .

In this section the consideration of the total activity of groups uses two main categories of activity analysis . The first , the distinction between Individual and Interactive activities , had been used successfully in the first study and is independent of the particular model of classifying activity according to a series of decision-making and control behaviours . The second analysis uses this model as its basis for characterising activity data . The results are considered under these two classifications of activity information collected through observation recording .

Individual and Interactive Group Activity

From the records of activity for each group [1] summaries were prepared showing the total use pattern by each group member of all possible contacts with other members of their together with the frequency of the occasions when they were working alone . In appendix 10.1 the groups are arranged in

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1. The records for activity were contained in the booklets of observation code sheets as illustrated in appendix 5.4 .

order of the total number of members in each group where activity observation sampling was possible . A total of twenty-six groups were observed . These groups are the same groups as the Post-exercise population [1] .

A preliminary examination was made of the distribution characteristics of the separate individual and interactive episode frequencies associated with all members of all groups . Appendix 10.2 shows the distribution of the amount of individual activity associated with all group members . The result is a distribution which approximates to normality [2] . The corresponding distribution of the number of contacts with others in the group (interactive) as shown in appendix 10.3 is not very close to a normal distribution .

Because of the close approximation to normality of the frequency of individual episode activity frequency for group members an analysis of variance was carried out to test the following propositions :

1. That variance in frequencies of individual activity associated with specific groups does not differ significantly from the variance associated with all groups with a similar number of group members .

2. That variance associated with individuals from a sample of groups with the same number of members does not significantly differ from the variance irrespective of the source groups' size .

The results of the analysis are presented in appendix 10.4 . The first proposition is supported in the results for all four populations of different group size . This is an important result . A factor related to the whole group of origin , given groups of a specific size , does not have a substantial effect on the amount of individual work carried

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1. But with three less groups in total because of the language spoken in those groups .

2. Note , however , that the sample size for the groups from which this data was obtained is not identical . Number of observations used in this section varied only between 21 and 23 for the whole series of groups .

on by members of the group . Patterns of individual activity associated with group members must be determined by factors related to either the size of the group or to a factor which is related to some characteristic of the total population [1] .

The consideration of the effect of group structure on the variance found in individual activity in groups is carried out here in this section , even though it represents an examination between group structure and group activity . It is done because the result will have a considerable effect on the way in which activity data obtained through observation recording can be used . The variance found between populations of different group size is ,at a confidence level of 0.01 , significantly different from the the within group population variance . However , with such a large total population (N is 157) this result is indicative of only a slight relationship between the actual size of the group and the amount of individual categorised activity found for members of that group [2] .

The relationship between the number of episodes with which group members were involved which were categorised as individual and interactive was investigated . As episodes can only be classified as either of these two types a direct inverse relationship should exist between the two frequencies . A complicating factor is that more than just two individuals may be involved in interactive episodes . Because the frequency of episodes for each group members when no interaction takes place has been found dependent on the size of the group of origin, a series of analyses with each group size population was carried out . The regression charts in 10.5 give the plots for groups with five and six , and seven and eight members . The regression of the number of interactive against the number of individual episodes does confirm a direct inverse relationship between these two measures . The regressions , in being linear , confirm that the frequency of "multiple" episodes does not

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1. For example , the characteristics of different tasks carried out by group members or the psychometric characteristics of the course member populations .
2. For groups of size 8 , 7 , 6 and 5 the mean number of individual episodes found for group members were 7.58 , 8.37 . 9.04 and 9.92 . respectively .

increase for those members of the group that have the lowest totals of individual episodes recorded . The difference between the mean number of interactive episodes for members from different group size populations is greater than the difference for the number of individuals [1] . Although an analysis of variance was not carried out because of the non-parametric nature of the data , the difference between the mean frequency of interactive episodes in groups was compatible with chance selections from a fixed group size population .

The average number of interactive contacts between individuals in the various groups does show an increase as the size of the group falls . The range of mean values was , like that found for the individual classified episode , small [2] .

Frequency of Decision-making and Control Activity in Groups .

The analysis of the completed decision-making and control purpose categories entered in observation records produced a very great amount of data . Implicit in the data is a further distinction between the dichotomy of episodes into interactive and individual type episodes [3] .

An earlier result had shown that the distribution of individual and interactive episodes had been dependent on some characteristic of group members which was independent of the actual group which the member belonged to . A first examination with the data about decision-making categories was to test for significant difference between the decision -making and control frequency profiles for these two types of episode . Appendix 10.6 shows the profiles of decision -making for individual and interactive classified episodes for the total group population in 5 person groups .

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1. Mean number of all interactive episodes found for group members were 22.7 , 19.1 , 18.3 , and 15.9 for 8 , 7 , 6 , and 5 person groups , respectively .
2. Mean number of interactive episodes between each possible pair were 3.24 , 3.18 , 3.66 , and 3.95 for 8 , 7 , 6 , and 5 person groups .
3. It is possible to introduce further hierarchic categorisation of data (specific pairs) - but sample is too small

On average , less decision-making and control categories are found in individual episodes compared with interactive episodes in the total observation records of group activity [1]. The categories of clarifying problem , identifying and identifying outcome , choosing action , and setting standards were were more frequent in interactive activities . By contrast , for the categories of recording action , sensing , and discriminating , the opposite was the case : these were more common in individual classed episodes . A series of t - tests were carried out with those categories which approximated to normal distribution[2] to find out whether the differences between means in the two types of groups were significant . All differences were significant at the 0.05 level of confidence , except for the category of effecting action which had significance at the 0.01 level .

This difference between the frequency of decision categories in individual and interactive episodes has three sources . It may be due to real differences in the actual use of the different modes of activity for accomplishing different decision-making and control functions . Some of the direction of difference supports this possibility . Possible actions might be expected to have been thought out and developed into a concrete proposal before others in the group become involved.[3] The assessment of a possible action , through the identification outcome and the secondary evaluation of outcomes , is generally considered to be best accomplished through the use of interactive methods[4].

A second source may be the particular characteristics of this group exercise . The recording of action is carried out in this BTA exercise by the completion of six decision forms . Each person in the group has , typically , a single sheet into which he can enter the results of his own decisions . In this example it might be expected that " recording action " episodes might be predominately found in individual episodes .

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1. In individual episodes 137.2 categories per 100 episodes . In interactive episodes 143.8 categories per 100 episodes .
2. T - test was inappropriate with the data relating to the activities of setting goals , sensing , and setting standard
3. Individual frequency found higher than Interactive frequency
4. Interactive frequency found higher than Individual frequency

The final source of difference could be the mechanism of observation recording and the method of recording the decision -making and control behaviours in groups . The means by which the data relating to decision-making and control activity is identified by the observer is quite different for the two kinds of episodes . The interactive episode contains a considerable amount of information in conversation which is both heard and interpretated in context of previous and later contributions . The identification of the purpose of individual episodes depends on the observer being able to ascertain the materials being used by the person being recorded and the type of clerical or calculation work being undertaken at the time . This type of procedure would not be possible in research using a group task which did not require a substantial amount of written work by group members [1] or in a research scheme in which the same observer was not available to record for all groups . Similarly , a high knowledge of the detailed sub-tasks implicit in the exercise is essential .

It is probable that all these three sources of difference are present in contributing to the actual differences found between the activity " profiles " of individual and interactive episodes . Fortunately , the sources can be ignored as the differences which do exist , although statistically significant , are small enough to ignore in further uses of activity episodes records where the distinction between interactive and individual is not maintained . The real effect of the difference between interactive and individual episodes is considerably reduced in practice because of the comparitively constant proportion of these two types of episodes in recorded group activity [2] .

The summary means for each decision-making category [3] in each of the four group size populations were examined : these are

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1. Apart from making calculations and records this included the construction of timetables , charts and memos describing reasons for proposed actions .
2. Significant differences between the individual / interactive ratio for group members carrying out specific tasks do , however , exist .
3. This summary gives a mean category frequency without differentiating between individual and interactive episodes .

shown in appendix 10.7 . The corresponding figures of the mean frequency of decision-making and control categories associated with the members of separate groups are listed in appendix 10.8 .

The final analysis of the sources of variance considered the within and between variance of category frequencies for groups of the same size . This , due to absolute frequency of some categories , was only possible for some of the categories in the model . Appendix 10.9 summarises the results of the considerable analysis of variance exercise carried out . The most important result is that for the great majority of the group population categories there is significantly less variation in the values of frequencies within particular groups than from the group population . The second important result , which facilities the first conclusion , is that the results obtained from the four populations are mutually confirming . These categories of decision-making and control can be arranged in order of the amount of variance determined by within group factors . The resultant lists [1] for the four populations are very similar [2] .

A further analysis , using the data about the frequency of the various decision-making categories , was to examine the relationship between the occurance of these frequencies in groups . As the independent frequency of these categories had already been shown to be related to some factor common to the group it was therefore expected that some significant correlations between activity types would exist . A multiple Pearson r correlation was carried out with the seven decision -making and control categories which had been demonstrated approximating to normal . The results of this analysis , with a total of eight correlation coefficients for each category pair , is shown in appendix 10.11 . The highest correlation coefficient between any two pairs is 0.501 . This indicates that 75 % of the variance in one of the categories

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1. Appendix 10.10 gives the list of Rank correlation coefficients for all possible combinations .
2. A Pearson rank correlation on these lists produced coefficients from 0.817 to 0.970 . 0.754 is significant at the 0.05 level of confidence .

is independent of the value of the paired category [1] . Coefficients which are statistically significant have been indicated . There is a measure of agreement on the values of coefficents for both individual and interactive populations and across the four size populations of groups .

A final analysis was an examination of the correlations between the different mean frequencies found for categories in each of the twenty six groups providing activity data records . This analysis was only carried out because substantial differences between the correlations of categories for different group sizes had been absent . A ranking method was used and all ten decision-making and control categories were therefore included . The results are illustrated in the vector diagram in appendix 10.12 . The degree and direction of correlation have been indicated by the spatial arrangment of the categories . The results are in general agreement with the results found for correlations associated with the categories for individuals in groups . The categories of discriminating and effecting action are not correlated with any other . A similar result had been found for the category data with respect to specific individuals . The main cluster of clarifying problem through to choosing action is also consistent with the result found in the earlier correlation exercise . However the correlation between identifying action and clarifying problem is very high when the low and non-significant [2] relationship between the frequencies at the individual level is considered . The explanation for this apparently contradictory result can be found in the analysis of variance exercise on the sub-populations . These two behaviour categories are highest and lowest , respectively , in respect of the variance which can be attributed to between group factors compared with within group factors .

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1. This category pair is identifying outcome / identifying action . The proportion of variance which can be accounted for by one category on the other , in all other pairs , is less than 25 % .
2. Result is 0.699 (significant at 0.01 level) . Earlier result was a correlation ranging from 0.105 to 0.221 .

Part Six

Relationships between Variables in the different Group Concepts in the Model .

The last four sections have examined , in isolation , the data obtained from BTA exercise groups under the concepts of group membership , group structure , group financial performance , and the activity of groups . The purpose of this section is to test for relationships between separate variables within each category with other variables in different group concepts . Apart from the testing of detailed relationships the section also considers the general validity of the total model of group functioning propose in part one of this thesis for predicting the identified significant relationships . The number of measures produced in each of the concept heads of group functioning in relations to the task of the groups which have been shown usable in statistical is quite limited . Appendix 11.1 lists , under each of the four concept heads , the relevant group variables .

Between the four sets of data there are a total of six possible combination pairs . The form of this section uses the possible pairs of concepts . The sequence in which the pairs are examined in this section is determined by the form of the general propositions made in part one between parts of the model . The financial performance of groups is first considered as the dependent variable and it is related , in order[1], against the three remaining variable groups . The remaining sequences considers the following pairs :

Structure of the group dependent on the group membership

Activity of the group dependent on group membership

and Activity of the group dependent on group structure .

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1. The order used was Group membership , followed by structure and activity .

Group Membership and Financial Performance of Groups .

Biographic and Psychometric information had been obtained from two of three important sources of group members populations . Real differences between the scores obtained on the administered measures and the age had been found slight , even though of significance statistically . A more considerable difference between these two sources of groups and the third group (senior managers from airlines) in the scores on membership variables can be assumed .

The regression analysis carried out on the profit obtained by groups in these three different populations produced a result which is very important for this section . There was no evidence that there was any variation , other than could be attributed to chance , in either the original profit or change in profit during the exercise which could be associated with these three distinct membership sources . If there was any effect of membership variables on the financial success of groups , which was significant in comparison with other possible sources of influence [1] , then differences in the regressions would have been expected .

The success measures of groups in the exercise can be related to two classes of psychometric and biographic variables . The first is the scores found for particular members in certain groups . The existence of a single group member's exceptionally high or low score might be a reason for a group's performance in the exercise . This possibility was tested for the measures of age , score on AH 5 , and the Pym flexibility result. No significant relationship was found between the actual highest or lowest value on these measures in particular groups with the measures of financial performance for that group . This result , coupled with the results from earlier sections about the formation and stability of both group structure and activity , supports the probably greater importance of the second use of the membership data . This is the development of data relating to individuals in a group

1. That is , in particular , the actual structure and activity of the group .

into some measures of the degree and range of the variable amongst the whole group . The specific group variables developed were the mean score or value for the whole group and the standard deviation of the variable in the group . These figures had already been derived in the section dealing with the characteristics of psychometric and biographic data . Tables giving the summary group results for the first and second series of psychometric measurments with the BTA Exercise groups are shown as appendix 11.2 . A rank correlation exercise was carried out and the results are listed as appendix 11.3 .

The first series of measures , age , AH 5 , and Pym , have already been found inter-correlated . Although only the mean age has been shown statistically significantly related to success [1] the direction and degree of correlation obtained with the other two variables is as would have been predicted from a knowledge of the existent relationship between the three variables . Correlations are highest with the relationships between mean scores and success . All correlations of these measures with the change in profit measures are lower than with the measure of initial success .

There is only one more correlation of statistical significance . This is between the standard deviation of Factor B in the 16 PF Personality Inventory [2] and the initial success obtained by groups in the trial decision period [3] . No special differences can be detected by arranging the results in groupings of mean / standard deviations or Initial success / Change in profit during the exercise . A summary of these correlation coefficients is given in appendix 11.4 .

The conclusion of this correlation exercise is that the biographic measures and psychometric scores and their variance amongst members of the group do not correlate strongly with the performance of the group as specified in two financial success measures . The values of correlations is , however ,

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1. Significant at the 0.05 level .

2. Or rather the mean value for the group .

2. Significant at the 0.01 level . This result contradicts the result of the other general intelligence measure . This may be an artifact of the low range of scores found for this B factor in groups . See comments on 16 PF Factor B in O.Buros (1972) .

above that predictable by chance alone from a series of thirty -six correlations . Additionally , the direction of correlation is , in the great majority of cases , that which might be predicted from a knowledge of previous research or from face valid reasons [1] .

Group Structure and Financial Success .

The rather voluminous data relating to the structure of groups is treated here in the same manner as in the chapter which considered solely the nature of the structure data . A very considerable number of correlation exercises are possible because of the amount of data collected by the use of the two questionnaires . Tests of relationships were carried out only with structure data which had received examination earlier and which appeared to successfully to discriminate between either individuals or groups . While the first - order structural data is the most important class of structural information used in this section the second - order material has been further used where the relevance has appeared high . The data relating to structure has been compared with the financial performance of groups in four heads . These are :

1. Data from the Inter - Decision Period Questionnaire .
2. Data from the general questions included in the Post - Exercise Questionnaire .
3. Data concerning the Allocation of Sub-Tasks in the Groups .
4. Data concerning the characteristics of Group Decision - making .

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1. An example of this concerns the factor Q_1 in the 16 PF Inventory . Self - sufficient people might be expected to do best in the first decision periods (Initial Profit measure) but that group - dependent people would improve over a longer period (Change in profit Index) . Both these propositions are supported , to some extent , in the correlation results .

1. Data from the Inter - Decision Period Questionnaire .

The responses which were provided for in the questions making up the inter - decision period questionnaire were not standardised . Seven , five , three scale , in addition to simple dichotomies , exist in possible answers to specific questions . In an attempt to make coefficients obtained comparable a single statistic[1] has been employed whenever possible even though this does imply a loss of power in the multiple response questions . The median score for each group has been categorised as high or low (as examples) according to the exact position of the median , that is , which side of the " neutral " position it falls . The results of this exercise are given as appendix 11.5 which gives the formation of the two categories for each question from the questionnaire included possible responses .

" Busyness " of Groups . Responses were used from only month seven . Significant differences between the response for different groups had been absent . No correlation of significance was found between the general classification of a group as busy or non-busy with the performance of the group as registered in the two financial success measures [2] .

Knowledge of what others expected . The results of both the first and seventh decision periods were examined . There is considerable correlation between the first group period assessment of what was expected of group members and the initial financial result . Although some correlation remains with the initial financial success figure up to the seventh month , this is no longer statistically significant . There is no correlation between the group average and the change in profit index .

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1. The point biserial r correlation coefficient statistic .
2. Appendix 11.6 contains the summary results of the point biserial correlation studies . Unless there is information to the contrary, the groups having eight and twelve decision periods in their use of the BTA exercise have been treated as a single population .

Inter-person Problems . There were no significant relationships between the reported presence of group " feuding " and the two measures of success . This is supported by the earlier finding that not only feuding was a rare occurance but that , in addition , was not associated with particular groups .

Level of work through decision periods . The pattern of response to this question has already been shown to be related to the actual tasks carried out by group members and that considerable differences continue [1] until the end of the exercise . An examination of both the level of work and the reasons for identified levels [2] did not produce results of statistical significance .

Knowledge of " Own " tasks in the Group . Because of the dissimilarity of the results for 8 and 12 month groups two studies were undertaken . Significant results were found for both course populations for month one and month seven . The groups that indicated a better knowledge of their task activities were those groups which did best in the exercise [3] . Correlations also exist with the change in profit performance value - but in this case the relationship is not statistically significant .

Knowledge of other group members' alloted tasks . A distinction between the two populations of groups was maintained in this analysis . Results were the same as those found in the last analysis . In the case of the correlation with the change in profit measure coefficients closely approached statistical significance .

General " Morale " . The difference between the results of 8 and 12 month courses to this question required the continuation of two populations for test purposes . The initial responses to this question show no correlation with the two measures of success . By month seven there is a significant correlation between the response and

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1. Although statistically significant .
2. As identified in question seven .
3. The initial performance measure .

the change in profit measure for the shorter course groups . The other three correlations are , at this stage , also in the same direction , that is , higher morale is associated with better financial result . This last result is an obvious illustration of the meaning of identified relationship between variables . Although the profit is conceived as the dependent variable it is likely that the morale is , at least , a part product of the actual financial success of the group . The profit for any one month must be related to both the initial profit and the change in profit measures .[1]

2. Data from the general questions included in the Post - Exercise Questionnaire .

The correlation of the individual's evaluation of his own and other's group performance with the initial success has been presented in an earlier section . The second group of questions , asking for the noting of factors which contributed or detracted from success , did not provide mean group values which correlated significantly with the two measures of success [2] . Groups that do well do not have a different insight into the apparent reasons for their success than groups that do less well . And the same result was found considering groups that do less well and their proposed reasons .

A further secondary outcome from the post - exercise questionnaire had been the calculation of the errors made by groups in identifying the actual tasks of others in the groups . A rank order correlation was applied to both measures of success for all major samples of group size [3] . No direct relationship was found between the degree of knowledge and the actual success measures . Correlation coefficients are

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1. The cumulative profit at month 8 is related to this by the regression equation (see appendix 7.7) . The intermediate cumulative profits are similarly related with the initial and change measures taking a larger and smaller , respectively , share of the variance .
2. Point biserial correlation was used .
3. Groups with size five , six , seven , and eight members .

shown in appendix 11.7 .

No direct relationship exists between the degree of knowledge of the group about its task structure and the initial measure of success . However , there is a substantial correlation between the error made by the group in its identification of structure and the change in profit measure of group performance up to month eight . One of the values is significant beyond the 0.01 level and another is close to significance at the 0.05 level . All the remaining correlations are in the same direction : that is , groups which are least able to specify their own structure are best at improving their financial status during the exercise . [1]

3. Data concerning the Allocation of Sub-Tasks in the Groups .

The first analysis carried out was an examination of the relationship between the mean number of tasks undertaken by members of a particular group , and the standard deviation , with the two financial success measures . An important , facilitating , result from the earlier chapter dealing with the structure variables , had been that the size of the group had not determined the mean number of tasks carried out by individuals . In this chapter , the independence of both measures of success and size has been similarly demonstrated . The results of a rank order correlation exercise [2] are not consistent with statistical significance . High initial profit is associated with both lower number of tasks per person and a lower standard deviation of tasks . By contrast , groups that improve their financial status during the exercise by a factor greater than predicted from a knowledge of the initial profit and applying the known regression equation , have a greater number of mean tasks per person and a wider range of values of numbers of specific tasks carried out by individual members [3] .

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1. This was the result found on a macro scale for a large number of industrial organisations by T.Burns and G.Stalker (1961) .
2. Included as appendix 11.8 .
3. That is , a higher standard deviation .

An attempt was made to relate the number of people concerned with specific tasks required in the exercise and measures of success . The first three tasks - considered both by the designers and administrators of the exercise to be particularly important in determining groups' success - were considered . These group tasks have a greater range of group members dealing with them than for most other tasks in the total task list [1] . The results , shown in appendix 11.9 , for a point biserial correlation , are that for all three tasks there are positive correlations with financial results . For all six correlations increasing number of people concerned with the three tasks is predictive of greater financial success . Correlations with the change in profit measure are higher than correlations with the initial profit : these coefficients approach statistical significance .

4. Data concerning the Characteristics of Group Decision - Making .

Rank order correlations were carried out between the predominance of a particular type of decision-making and the two measures of success . Two negative correlations [2] were obtained although not reaching levels of significance . There is no substantial relationship between the structure of decision - making adopted by a group and the financial results it obtains . The direction of correlation suggests that those groups were decisions tend to be made by those people who are concerned with the various activities preparatory to a decision , do better , both on the initial and change in profit measures , than other groups . An investigation of the decision-making found for particular tasks and measures of group success did not produce coefficients which could not be expected from chance alone .

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1. Standard deviations for tasks 1 , 2 , and 3 are 1.97 , 1.56 , and 1.16 , respectively .

2. Results were - 0.178 and - 0.247 with the two measures .

Group Activity and the Financial Success of Groups .

Reference is made in this section to the results obtained in the preliminary study with the BTA Exercise , as it was this group of variables where most significant results were obtained [1] . The treatment of data in this section has been rather different and comparisons have only been made when the two sets of data and treatments are consistent .

The distinction made in the recording of activity data as to whether an episode could be classified as interactive or individual has been shown [2] to be unimportant in effecting the main characteristics of that episode . In particular , the profile of decision-making behaviour found was not generally significantly different . Additionally , the range of individual and interactive frequencies in groups was random and the proportion of each varied only a little . A trial correlation was undertaken between the group mean frequency of individual activity and the two success measures[3]. Two negative , non-significant , correlations were found [4] . The higher the number of mean episodes which could be classified the higher both the initial and change in profit measures for that group .

A corresponding rank order correlation was carried out on the frequency order of each decision-making and control category in all groups with these measures of financial performance . A pattern of correlations between the frequencies of these different categories and further pattern of correlation with success would be expected . Appendix 11.10 gives the table of results for each decision-making category . Included is a summary group figure which represents the frequency of all decision-making categories per unit number of episodes . The results show a wide range of correlations with profit .

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1. See pages 116 - 118 .
2. See pages 175 - 176 .
3. Rank rho correlations .
4. Correlation coefficients of - 0.184 and - 0.129 with initial and change in profit , respectively .

The group of decision-making categories clarifying problem , identifying action , identifying outcome , and evaluating outcome [1] are statistically significantly related to the change in profit measure . The greater the frequency of these decision behaviours in activity records for members of groups the greater is the improvement in the profit achieved in the exercise . The expected result of the noted negative [2] correlation between choosing action and evaluating outcome is supported because of the significant negative correlation between episodes including choosing action and change in profit . A smaller negative correlation exists between the frequency of effecting action and change in profit .

Only two of the decision-making categories are found positively correlated with the initial profit measure . These two categories , setting goals and setting standards , have previously been found significantly inter-correlated and not correlated with any other category frequency .

The " decision-making and control purpose " content of group episodes , therefore , has substantial relationships with measured success . The " core " decision categories in the model of decision-making and control are those that are related to the ability of a group to improve its financial performance . The negative relationship between the frequency of choosing action and effecting action [3] and the trend in group profits can be explained most logically by the use of these " categories " by groups as a means of keeping the group busy later in the use of the exercise [4] .

This identification of a relationship between the relative frequency of certain decision-making categories and the derived change in profit measures is an extremely important result for this research . The more time that a group is recognised as being concerned with the central decision-making functions the greater is the ability of the group to

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1. This is the largest cluster of inter-related decision behaviours in appendix 10.11.
2. See appendix10.11.
3. Not to a level of statistical significance with the effecting action frequency .
4. Described in pages 107 - 108 .

obtain a better cumulative profit than would have been predicted from a knowledge of the results it achieved in the trial decision period .

Group Membership and Group Structure .

The measures of the characteristics of individuals making up specific groups in the BTA sample had been found approximately distributed with respect to the groups [1] . By contrast the number of tasks associated with the members of groups and the type of decision-making structure identifed has been shown to be statistically dependent on the particular group of origin . These results suggest that the structure measures are likely to be unrelated to the various psychometric and biographic measures of group members . There are , however , two possible types of relationships which do not necessarily conflict with this finding . Particular tasks and decision -making structures associated with individuals could relate to membership information about individuals . In addition , mean scores of biographic and psychometric measures for groups , although not significantly different , may be related to mean structural descriptions . The treatment of these two concepts inter-relationship separates these two sets of analyses .

Membership data and Structure relating to Individuals .

The data about the number of tasks carried out by individuals has already been shown to being normally distributed [2] . Similar results had been found for the age , certain 16 PF factors , AH 5 , and the Pym measures [3] .

A graphical examination of the relationship between group members age , scores of the first series of tests [4] with the number of tasks carried out by the respective group member is shown as appendix 11.11 . Results indicate that no relationship with the structural

1. See pages 150 - 154 .
2. See page 168 .
3. See appendices 8.3 - 8.5 .
4. Including the AH 5 measure of general intelligence and the Pym measure .

measure . A second analysis considered the results for the later used measures [1] . Similar results were found [2].

Another series of studies using data relating to individual group members was undertaken . In this analysis a distinction was introduced by identifying group members according to the various group tasks they were active in taking part in . To facilitate a simple staistical test two types were identified . The first were those concerned with some or all of the tasks 1 , 2 , 3 and 4 and the second group with 8 , 9 , 10 , 11 , and 12 [3] . The scores on the various measures for these two sets of group members were examined . The differences in means for the age , AH 5 and Pym scores were not significant , although the differences [4] were in an expected direction . Similar non-significance between means were found with the 16 PF factors Q_1 and Q_2 [5] .

Consistent differences in the type of decision-making reported by individuals within the same group do exist . Studies were carried out to see if differences in the perception of the decision-making structure present in group was related with psychometric variables . No deviance from a random distribution of identified decision-making - either in total or with respect to particular tasks - was found for any of the various psychometric factors .

Membership data and Structure relating to Groups .

The two summary structure measures relating to groups used here were the mean number of tasks being carried out by group members and the group concensus about the type of decision - making structure present to deal with the tasks . Rank order correlations were undertaken

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1. 16 PF and Connolly Occupational Interest .
2. Visual regression analyses are presented in appendix 11.12 for variables Q_1 , Q_2 , and K .
3. The group members must be carrying out any of the tasks in the paired lists .
4. Appendix 11.13 .
5. 6.68 and 7.21 for Q_1 . 6.06 and 5.93 for Q_2 .

between these two measures and the selected psychometric variables . Appendix 11.14 summarises the correlation coefficients and the statistical significances for the sixteen tested relationships . Two correlations are statistically significant and there are a further five relationships which are close to the 0.05 level of confidence .

The mean number of tasks carried out by group members is found to be very strongly related to the AH 5 mean score . The earlier noted dependence of the number of tasks being carried out by the group on a common group factor can be partly accounted for the mean AH 5 score . The result is found for the mean Pym flexibility score.These two group factors contribute a high proportion of the variance in the number of tasks being undertaken in the group . The direction of the identified relationships between the factors Q_1 and Q_2 is that which could be expected from the factors that they represent . The more liberal the group [1] the greater is the number of tasks which each member is carrying out . The more dependent the group the greater is the number of tasks which each member is carrying out [2] .

The predominant decision-making structure perceived in the groups is not related to the age , flexibility , general intelligence series of measures , but <u>is</u> strongly correlated with factors Q_1 and Q_2 of the 16 PF Inventory . The direction of correlation is the opposite of that found with the other structural measure . Shared and total group involvement in decision-making is related to <u>conservatism</u> and with <u>self-sufficiency</u> . Neither result is to be expected from the constructor description of these factors .

Connolly results for whole groups had no relationship with either of the two structure means for groups .

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1. High score on factor Q_1 .
2. Dependency is characterised by low scores in factor Q_1 .

Group Membership and Group Activity .

Studies were carried out correlating the summary group membership variables against both the frequency of interactive activity in the group and the separate and total frequency of decision-making categories . The test used was a rho rank correlation [1] .

The amount of interactive activity , as measured by the frequency of interactive episodes , was found unrelated to all mean psychometric scores and their standard deviations [2] . The correlations coefficients obtained with the frequencies of the separate categories of decision-making activities are shown in the table included as appendix 11.15 . Only a single correlation is statistically significant [3] . The grouping of categories according to the known and significant occurance inter-relationships between decision-making categories , does produce some conclusions of note [4] . Coefficients within groups do show considerable agreement .

The relationship between the summary psychometric descriptions of groups and the characteristics which have been measured of group activity can only be described as slight - contributing a small part of the total variance in observed group behaviour summaries . A more definite relationship can be expected between the activity associated with individuals and their scores on some psychometric measures . Appendix 11.16 includes a series of regression analyses of the scores of individuals on three measures [5] on the relevant number of episodes that each person was not interacting with others in his group [6] . Increasing conservatism and higher scores on the Pym measure are associated with less non-interaction .

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1. Apart from data relating to age , the sample size for these tests was less than 20 .
2. No coefficient was greater than 0.20 .
3. This is less than might be expected from chance alone .
4. The designation of " significant " conclusions is , of course , effected by the small samples being used here . Coefficients were as high as 0.596 without being significant
5. These three have been included because of the result interes
6. Chosen because of the parametric treatment possible with this data .

The result for the Q_2 factor of 16 PF is included as the regression indicates a surprising lack of a relationship between the group-dependent / self-sufficient dimension and the measure of non-communication with others .

The second series of analyses using the knowledge of the scores obtained by particular group members considered the amount of interaction [1] between pairs of group members with particular scores . The scores on both the Pym measure and factor Q_1 were examined in this way . The results [2] confirm the relationship between the non-interactive episode frequency and the membership measures , just reported , is independent of any relationship between interactive and individual frequency . This is because the values of the two paired scores do not significantly effect the measured amount of total interaction between these pairs of members during the business exercise . While the relevant scores for the Pym measure do vary significantly over the matrix , and in the direction [3] predicted from the correlation between Pym and frequency of non-interaction , there are many inconsistencies .

Group Structure and the Activity of the Group .

A point biserial correlation exercise was carried out with the second order structural measures and the two summary measures of group activity [4] . The results [5] indicate that there is no general significant correlation between any of the measures but that a number of individual significant results are present . In particular , the registered knowledge of tasks that others are carrying out in the exercise is associated , significantly [6] , with the frequency of decision-making categories for that group . This is found for

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1. Number of episodes when both group members were involved .
2. Shown as appendix 11.17 .
3. Increasing paired scores is predictive of an increasing volume of measured interaction between the two members .
4. Total frequency of interactive episodes and the frequency of all decision-making and control categories .
5. Appendix 11.18 .
6. Approaching the 0.01 level of confidence .

both the short and long course groups . Although actual statistical significance is only present in the results for month seven , a close approach to significance is found for both populations even at the first month .

A preliminary examination of the relationship between the first-order structure measures and the activity found in simulations considered the structural characteristics found for individuals and the activity patterns for these same individuals . In spite of the noted absence of important differences between the nature of individual and interactive episodes this population distinction was retained . A first test was for a relationship between the number of tasks each group member was identified as carrying out and the total frequency of episodes in which that member was involved . Appendix 11.19 shows the two resulting contingency tables . There is visually no correlation between the two sets of measures represented in each table . A further study examined the pattern of individual and interactive activity found for two populations of group members carrying out different tasks . The same different sequences of tasks used in an earlier analysis [1] was adopted . A total of 66 group members were available performing Type A tasks and 23 performing Type B tasks . Tests for significance of difference for the two populations of individual and interactive episodes indicated significance beyond the 0.01 level of confidence [2] . Groups members engaged with Type A tasks have higher and lower frequencies of interactive and individual episodes , respectively , than group members concerned with tasks of Type B . The pattern of individual and interactive activity found for group members is therefore influenced by the nature of the tasks being carried out rather than the absolute number of tasks being carried out .

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1. See page 193 .

2. Results are included as appendix 11.20 .

A second analysis using the separation of individuals based on the type of tasks they carried out considered the relative frequencies of decision-making and control categories found in episodes . The distinction between individual and interactive episodes was retained . A two tailed t - test was carried out for the two task types populations . The results of the two series of tests are shown as appendix 11.21 Significant differences are present for the majority of compared means for decision category frequencies . Results are especially significant for interactive activity episode population . The type of task being carried out by group members effects the decision-making and control aspect of interactive activity more than individual activity. [1]

A final series of studies looked for relationships between group summary measures of structure and the corresponding summary measures of the amount and pattern of group activity . The separate consideration of the size of groups had already indicated a small , though significant , relationship with relative frequencies of interactive and individual activity . No further relationship between group structure measures and the pattern of interactive and individual episodes in observation records was detected . The extensive analysis of variance exercise with the absolute frequency of decision-making and control categories had shown that there was less variation between the frequency values obtained by the members of particular groups compared with the variation between groups . A series of rank order correlations were carried out to test whether the three summary structure measures [2] were correlated with the mean frequency of each decision-making category found for every group . The results support a null hypothesis [3] . The single significant

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1. Which was the result found for pyschometric characteristics (page 195) .

2. a. the mean number of tasks carried out by members in each group .
   b. the variance of the actual number of tasks .
   c. the " type " of decision-making represented by a rank order .

3. The table of correlation coefficients is shown as appendix 11.22

correlation found between a structure measure and frequency of decision-making and control activity was consistent with chance occurance . The three tested measures were , therefore , not related to the pattern of category frequencies found for groups carrying out the BTA exercise . Further examination of the numbers of the'members of group concerned with specific tasks did not produce significant correlations with measures of activity category frequencies .

Section Four : Organisational Research using Management Groups in British European Airways

Part One

Organisational Research using Management Groups in British European Airways .

The success of the studies using the simulation-based groups in producing usable and apparently significant measures of structure and activity was a contrast to the results from the earlier organisational project . A decision was made to apply the same basic method and techniques to the study of the structure and activity of real organisational groups . Apart from the intention of wishing to carry out a self-contained research project it was intended to test some of the methods and particular results of the extensive research with groups using the BTA Exercise .

Before field work was designed the available methods of characterising the work performance of different Organisational Groups were examined . Before the research in BEA began [1] BEA was not an organisation with an emphasis on the comparitive performance of internal units . However , during the period when the research was being carried out a number of systems aimed at assessing performance of certain groups of staff were introduced . These were :

1. Introduction of Profit-centred Accounting . All recognised management units within the company began to " charge " other parts of the corporation for services and facilities provided . An the end of financial or interim periods it was possible to identify a profit or loss with specific departments .
2. A preliminary " Management by Objectives " exercise was in progress in one large division in BEA [2] . They were plans to extend this exercise to other divisions within the planned research period .

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1. Before autumn 1965 .
2. The Engineering and Maintenance Division of BEA .

3. Operational units based on all european airports were assessed for performance each month [1] . This performance measure was based on the total delay which had been acrued by aircraft passing through airports . This data was used in an annual competition with prizes awarded to the " best " results .

Neither of the first two internal measures associated with groups was , on examination , of much use in assessing real unit success . Both exercises were very new and at the time of the study the units which were being " rated " were much larger than could be covered by the projected methods [2] . The third measure , that of operational success associated with groups of staff at airports , was considered at some length . The sources of data for this measure were examined and the staff concerned with the preparation of material were interviewed . Records of this measure over a year indicated that there was a degree of continuity between the results for different periods for the same station . Some method of correction was applied by the staff administering the scheme based on their own assessment of the unavoidable [3] problems found for each station . Staff at airports were generally of the opinion [4] that the system worked quite equitably - but that not all technical and physical factors were taken into consideration .

This third measure was not used because the staff responsible for creating of delays at airports do not belong to a distinct management group . The actions of the Traffic handling staff [5] may be insignificant , in some cases , to the actions of Reservations staff based away from the airport . An ancillary reason was that the delay measure is

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1. This performance measure had been used for many years but had recently undergone a radical change .
2. Approximately of the size of the Internal Services , German
3. Fixed facilities at each station being the most important . Even the aircraft operated on certain routes was important - certain aircraft require longer between flight maintenanc
4. Comments had been made by staff interviewed in the Internal Services project in Germany in Section two .
5. Section 2 part 1 has a description of these functions .

a performance standard which covers only a very small part of the total work activity of the various operational work groups at airports .

The research design of the project involving organisational groups was effected by this inability to procure a valid measure of task performance which had been possible in the studies with simulated groups . The research was therefore based on the examination of the relationships between the structure of the group and its recorded activities . At the planning stage of the research no decision was taken on the extent to which either biographic and psychometric data about members of organisational units would be sought . The collection of membership information was , in practice , not possible [1] .

Methods used in the Study .

The greatest difference between the methods used in the simulation study and the methods developed for the real organisational groups project was the application of a self-analysis and recording of data system by group members of their own activities . Diary - recording becomes the only method which will cover a large percentage of all episodes , both individual and interactive , for a group of managers examined simultaneously . The use of this method requires , not only a high level of real participation by the group studied , but also a considerable familiarity with recording materials and a knowledge of the concepts implicit in any system of categorising their activity . Use of the model of decision-making and control model in both organisational and training environments had indicated that the concepts associated with the proposed classification of activity were comparitively easily understood and relatable to real managerial activities .

In the BTA Exercise there had been a list of fifteen tasks making up the total task demands of the exercise . At this

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1. The mangers in BEA with whom the possibility of testing was discussed could not support the only practical way of administration : Group tests with all members (and management levels) of a management group present .

stage in the research it was impossible to develop a method of classifying tasks [1] . As with the BTA Exercise each management group was considered as containing many different distinct sub-tasks which would include all the activity of the group members . Some research was carried out before the diary system was designed and it appeared that a list of between twenty and thirty tasks would be sufficient to both describe and provide a basis for possible differentiation of tasks between group members . With such a list for each management group all of the analyses carried out with regard to structure in the simulation study would be achievable .

The format of the diary recording form was based on the structure of the observation recording form used in the earlier simulation studies . The final appearance of the form is shown as appendix 12.1 . A number of special considerations influenced the design . An important part of the analysis of the results would be to check for the difference in perceptions , by two managers , of the same recorded episode . The identification of particular episodes had to be made by the members completing the forms so that comparisons could be made . Each page in the booklet of recording forms was made to represent a single hour in the working day . The left-hand number grid on the page refers to the minutes within that hour . Entries were made by diary-keepers at the conclusion of each distinct episode on the line which represented the actual time (in minutes past the hour) of completion of that episode . The system was therefore still capable of providing compatible records even in situations were the diary keeper was unable to make continuous records [2] .

In order to keep the diary form as simple and concise as possible - for both completion and later analysis - code number and abbreviations were used . For each group that took part in the project a summary and reference guide was prepared which indicated :

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1. See the comments on page 19 .
2. Occasioned by attendance at formal meetings , being in transit or due to pressure of immediate work .

the person represented by the number code refering to the management groups members .

the descriptive list of tasks making up the work of the management group .

a reminder of the list of decision-making and control purposes of task activities .

Each group members was issued with a copy of this guide with sufficient " hour " diary sheets formed into a book to be sufficient for record keeping for up to seven days . The diary recording was planned to take up a working week - the date of which could be selected by the group to ensure that as many as possible could take part .

A trial of the diary system and the recording form was carried out in the Personnel Research Unit within BEA . The objective of this exercise was to confirm that the completion of the diary did not add significantly to the completion of normal work - that other persons , not connected with the project , were not distracted by the keeping of diaries - and that the specific forms were ergonomically satisfactory . The coding used in this project and the summary of quantitative results for this study trial are shown as appendix 12.3 .

Once the method of activity information had been shown to be feasible in use further time was spent in devising a system of introducing the mechanism of diary recording and the recognition of categories of control and decision-making episodes [1]. The only practical way was through printed descriptions which could be read by the various management group members at their own pace . In addition , the researcher was available , both in person and at the end of a telephone , to answer queries which might be forthcoming . A substantial booklet was produced [2] which was designed to be issued to group members when general agreement to specific studies with

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1. The person who carried out the trial use of the diary - recording to register activity had previous close acquaintance with the concepts of this research .
2. The final version of this booklet is shown as appendix 12.4 The actual size is demonstrated by appendix 12.5 . The booklet was printed on both sides to facilitate the example included in pages 3 , 4 , and 5 .

a management group had been given . This booklet sought to impart information about the total research project in BEA , the diary completion mechanism , the various sections in the recording form , and the description of the categories making up the decision - making and control model . The order was as implicit in this last sentence . The exact wording on the important section dealing with the operational definitions of the categories of activity was changed many times before research use and subject to ease of comprehension tests with a sample of roughly equivalent levels of staff that would be encountered in groups . A more concise introduction to the study was prepared for use before the main briefing document was issued [1] .

The Structure Questionnaire [2] , developed for use with management groups , was considered as the approximate equivalent of the Post-exercise questionnaire used in the simulation studies . Apart from the general questions three and four , the questionnaire attempted to obtain the same data that had been achieved with the post-exercise instrument . The specific question concerned with the identification of the tasks with which each individual in the group was concerned was the same as in this questionnaire . The questions dealing with the elucidation of the decision-making structure was extended to cover the possibility that decisions about certain group listed tasks might be the responsibility of a person outside the recognised membership of the management group . In place of the single question in the simulation group questionnaire , a series of questions were introduced to cover the increased range of structures possible for each identified task . This questionnaire , like the introductory and briefing booklet , was reduced in size and printed on both sides to facilitate the use by the members of management units selected .

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1. Appendix 12.6 shows the introductory discription used .
2. The final version , used in all studies , is included as appendix 12.7 .

The studies with BEA Management Units

When the design of the organisation study and the materials to be used had been completed , an examination of the various distinct managerial units in BEA was carried out . The following list of criteria were used in helping select the groups which were approached by the researcher with a request to participate in the project :

1. Some members of the group had taken part in either management or supervisory training during the past few years .
2. The section had not taken part in any recent research - or had been extensively studied by internal staff from a service function .[1]
3. That the section had been uneffected by the comparitively recent reorganisation of BEA .
4. The group had some period of continuity in the period immediately before the study was to take place . For example , no change in detailed membership of the group .
5. The group , during the period of the study , would not be subject to special and intensive seasonal demands effecting the level of work required of group members [2].
6. The leader of the section was not known to be hostile to either " research " or the demands of other units in the organisation .
7. That the number of members would be both a general size that was similar to the corresponding size of groups in the BTA Exercise studies , and where the proposed mechanism of collecting research information would be feasible .

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1. In the period 1963 - 66 , BEA had provided facilities for a number of studies carried out by independent researchers (R.Presthus 1964 and E.Trist 1965 - 66) . Those who had contributed to these studies had been disappointed by the lack of feedback on completion of the studies .
2. Many parts are subject to known seasonal work activity . This is a genuine phenomenum , but which is often used to reduce other activities (for example ., training) .

The specific reason for the first criterion was that it would be an advantage if some members of the group were familiar with the concepts and specific methods which they had already encountered in recent training environments . In addition , it was thought that groups where a number of staff had attended courses might be those with a more positive attitude to organisational research .

Two sources of information about BEA's structure and managerial activity were present in BEA and these were examined for groups of managers which met most of the requirements . The first source was the BEA Organisational Manual . This was a considerable loose-leaf file which printed the relationships between the staff in recognised units [1] in a hierarchical pattern . Sections were grouped and printed on the same page if there was some recognised relationship between the various tasks carried out in the two sections . An example of a single page from this manual is shown as appendix 12.8 . The series of charts was kept up to date in all main section offices . The date of the last change in structure was implicit in the printing date which was included on each separate page in this manual . The second , and much less important , source of general structural information about the function of each main section within BEA was the introductory booklet [2] printed by the Training Department .

Letters were sent round to each of fifteen management units , selected in an analysis as described . Each letter was styled differently according to the researcher's knowledge and previous contact with the separate sections . A typical letter - to a group which did not actually take part in the study - is shown as appendix 12.9 . Each letter contained a final copy of all the materials which would be used in the study . Each section head was visited by the researcher within a week of the dispatch of the letter whether or not a reply had been received . The content of the conversation was to give greater background information about the project , to

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1. Described internally as departments , divisions , and sections .
2. " The Organisation of BEA " printed by BEA in 1964 and available until 1969 .

explain the function and administration of the materials which would be employed , and to seek some kind of preliminary approval for the project . The importance , to the research , of getting both willing participators and good responses to each of the instruments was mentioned . The two major points raised by the managers visited were to enquire for an estimate of additional workload which would be implicit in diary-recording and to find out what kind of feedback would be available to them or their section at the end of the study . Four of the managers initially requested that a report should be available at the end of the project - the research topic being of immediate interest Agreement was reached with these managers that information available would be given to all members of the group but would be unavailable for any other sections within BEA . In each of these four cases the manager made it clear to other members of the group that information would not be used for any control activity . A number of groups and individuals interviewed gave their agreement to the study with the condition that they as individuals or their sections within BEA would not be linked in any report with the structure and activity information collected . All group data is presented without reference to the name or description of the particular section within BEA . It is possible , however , to deduce from the list of basic tasks in appendix 13.1 the approximate functions and likely section titles . Since this project was carried in 1968 change has affected all the management units which were eventually involved in the research and it is no longer possible to relate any data in this thesis to either individual people in BEA or particular sections .

Once a section had decided to take part in the study a time-table was prepared which took into account the requirement that more than two distinct studies could take place in any specific week [1] . The decision about the allocation of code numbers to particular individuals within each section was thought very important by a number of senior managers . The

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1. The planned observation / diary-keeping validation exercise required at least two working days with each studied group .

allocation of particularly numbers to individuals in the management unit . This resulting in a number of the lists implicitly representing the managerial status within the group .

The actual selection by a group of its task list was not always as described in the model procedure suggested in the first questionnaire and information booklet . The table on the second page of this booklet was usually preliminary completed at a meeting between the researcher and all the members of the group . Before this meeting a preliminary list of tasks which had been prepared by the leader of the group [1] had been discussed and revised in a meeting between this group leader and the researcher . The opportunity was genuinely provided for each member of the group to develop , change or add tasks to the list as long as agreement was forthcoming from the other members of the group . At this final meeting the various problems associated with the method of diary-recording and the concepts and operational definitions of the activity categories were presented and discussed . Participants were encouraged to try out recording for at least a working day before the project was begun and to contact the researcher to seek clarification on any procedural or interpretation problems .

The actual diary-recording sessions took place in three months [2] in 1968 . Groups were encouraged to select a Monday to Friday period . In two cases a mid-week to mid-week diary keeping session was used[3]. There were significant problems in finding periods when the majority of the group would be present for at least five days . In one case the amount of leave being taken over the research period made a new procedure necessary . This group was considered as being composed of two groups and was subjected to two separate diary studies to allow a maximum of group members to keep task and activity records .

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1. In a number of the groups the leader of the management group was the only person to be aware of the full range of tasks being undertaken in the group . The tasks of this senior manager , in particular , were not known to the remainder .
2. April , May , and June .
3. The selected period corresponded with the start of the BEA annual leave season . In addition , there was a higher incidence of sickness than usual and a National Rail Strike .

The fifteen groups approached by the researcher produced a total of nine groups who started the diary-keeping stage . Diary records were obtained with all these groups . There were , however , a number of unstarted or incomplete returns from the management units . Observation by the researcher was carried out for at least a single member of each group. A form identical to that used for diary recorded was employed . Completion of the final questionnaire at the conclusion of the exercise was rather less successful than the similar questionnaire which had been issued at the end of the BTA Exercise . The results of the diary recording and structure identification exercises are included in following parts of this section of the thesis .

A second attempt was made at the end of 1968 to obtain further groups . This included some new groups , but was primarily those groups which , for given reasons of unusual workload , had declined the earlier invitation to take part . This object of this second project was designed to supplement the results obtained for the first organisational study and , in particular , to attempt to obtain better post-diary keeping questionnaire responses . In spite of some considerable effort no further management groups were able to take part in the project within the research period planned .

Part Two : General Results of the Organisational Research and the Group Structure measurements .

The following section summarises the results of the use of the described methods in studies of management groups . General results obtained and the apparent reliability of the two measuring instruments are considered . The results found which relate to the concept of group structure are included in this section . Comparisons are made with the results found for the simulation groups and with the recognised formal structure of the group . The detailed analysis of activity results and the relationships between group structure and group activity are excluded from this section .

The first result relates to the identification by groups - before the start of diary-keeping - of the task list which represents the total task requirement of the group to be included in the study . This list is used in both the diary recording and the questionnaire completion by group members . Appendix 13.1 lists the actual tasks included in the lists of seven groups . This appendix includes some groups which , although reaching this stage in the project , were not one of the nine groups which kept diaries . Groups which took part in the study , but which are not included in this appendix , are excluded on request from that group . However , the list of tasks is representative of the groups for which lists have not been included .

A total of thirty-seven completed diaries from nine management groups were collected during the project . The data about management group interaction is rather greater than that suggested by this figure . The thirty-seven diaries relate to interaction which involved a total of sixty-five members of management groups in BEA . Summaries produced from each of the diaries indicated only the amount of contact between the diary keeper and others , and the relative frequencies of various decision-making and control categorised activity . The frequency of these categories of activity within particular diary entries - or the patterns in sequence of episodes - was not developed or considered in this research . The production of these summaries for individual

diary records , dispite a format which was designed for easy analysis , was a lengthy exercise . Appendix 13.2 gives the resultant data summaries for each group member that returned a completed diary .

A number of studies were carried out on the data from the individual activity records . Appendix 13.3 shows the frequency distribution of the number of hours and numbers of episodes represented in each diary return over the whole management groups population . Apart from three records which covered between fourteen and seventeen hours the reason for the totals being less than the working week was the diary recorder's absence from his normal workplace . The variation in the number of episodes recorded is much greater than the equivalent variation in the time during which active diary recording was carried out . Further summaries produced give lists of the groups observed [1] with the number of members returning diaries and the total number of group tasks[2], and the list of the individuals who were studied by the researcher during their keeping of diary records[3].

Of the thirty-seven group members who managed to return completed diaries only twenty-nine returned the structure questionnaire . Enquiries were made as to the reasons for such a low response . The most important cause appeared to be a lack of comprehension about what was actually required . Unlike the questionnaire which had been used in the courses no immediate counseling was available as the questionnaire was completed by members of management groups . In general , the questionnaire was not returned by more junior in status and the older members of staff . There was also a correlation between the length for which diary-recording was maintained and the likelyhood of having a questionnaire returned from members . This suggests that that material obtained from the structure questionnaire is not a sample but represents various task and decision structures better than would have

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1. Code numbers have been adopted to facility cross - reference between results for specific groups .
2. Appendix 13.4 .
3. Appendix 13.5 .

been found in the non-completed questionnaires . Responses to questions three and four are summarised in appendices 13.6 and 13.7 . There are no significant differences between the responses obtained for different groups . There was a further (although not statistically significant) relationship between the total quantity of data [1] in the responders diary record and the " positiveness " of his answers to these two questions . The method of diary recording appears to have become neither tedious during the single week of recording or , except for a few individuals , a great addition to their normal workload .

Summaries of the results for questions five , six , and seven were produced for all groups providing significant returns [2] . They were no results of note from this summarising of returns .

Reliability of Diary Data

The individuals used in the reliability check on the diary recording system were those group members least mobile in their daily work . This implied that before the start of the study they were able to confirm that they would be in their own office for a substantial period during the diary -recording week . This was done for two reasons . First , it would facilitate a large amount of data registration in diaries . The second reason was that the presence of an observer making observation records would be less disturbing in a fixed location .

The observer was present for approximately two days in most cases . Appendix 13.11 lists the summary results for the thirteen group members observed . This includes both the results from the observation record keeping as well as the diary record summary . Before these two activity profiles were contrasted the characteristics of the test period with the total records were examined. The profile for the period during which observation recording was carried out was related to the total diary profile . In particular , the number of epi-

1. As measured by the total time during which diary-recording was maintained .
2. Results for questions five , six , and seven are given in appendices 13.8 , 13.9 , and 13.10 , respectively .

sodes recorded during unit time did not show a significant increase during the period when the researcher was present making recordings . This result supports the non-influence of the presence of the recorder on observation diary recording and the ability of group members to enter diary material even when a observer is not present [1] .

There is correspondence between the summaries for observation records and the parallel diary records . For the purposes of statistical test the activity was considered under three heads . These were , the contact frequency with other members of the group , the decision-making and control category frequencies , and the task identification frequency . Split - half Reliability Coefficients were calculated for the eight observed group members who had the highest episode frequency . The results are listed in Appendix 13.12 . All coefficients are significant (0.01 level) . The specific correspondence between the identification of contact with others in the group by the manager and the researcher is very high [2] . The coefficients for the other two measures of summary activity are rather less - with some atypical results [3] . An examination was made to identify the sources of difference in the diary / observation records . The results for particular episodes in the pairs where correlation had been low , were studied . The following characteristics were found :

1. Considerably less data had been entered by the diary keepers for particular episodes than had been noted by the researcher . Thus while the researcher might have noted two or three categories , the manager may have entered on a single category in the diary .
2. Errors in identification of tasks seem to be constant for members of the same management group . This suggests either that the researcher was insufficiently aware of the task list - or

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1. However , this only applies to the selection of managers that were studied . The amount of data entered by these people is greater than average and suggests the existence of a special effect .
2. Which would be expected - individuals are more concrete than decision or task descriptions .
3. For example , 0.667 , 0.696 , and 0.570 .

that the task categories do not correspond to actual task differences recognised by group members .

A further test of reliability of data contained in diary summaries was made by applying split - half tests to results for the ten group members with the most identified episodes[1]. Instead of comparing the profile records a second procedure , involving the development of indices , was used . This was done as , although the specific content of activities may change during the week of recording , the pattern of contact would be more likely to be constant . The indices selected and used were :

1. The mean number of tasks identified by diary -recorders with each episode .
2. The mean number of decision-making and control categories identified in episodes .

and 3. The mean number of people involved in interactive episodes .

The list of the various indices [2] for the first and second half of diary records for each individual , together with the chi-squared statistic , is given in appendix 13.14 . All chi-squared values are significant : there is an association between the value of the index in the first half with the corresponding index value in the second half of diary records . The values obtained for particular members are significantly different from each other . The stability of the index suggests that diary data collected over such a short period as a single week can be a realistic sample of normal work activity .

For two diary records of specific managers the split-half profiles were graphed (appendix 13.15) . In these two examples there is close correspondence of the detailed frequencies in each of the three separate sections of categorisation .

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1. The " mid-point " was determined by the central position of the total time registered in diary records and not the middle of the week in which recording took place . See appendix 13.13 .
2. The range is considered elsewhere .

A final check of the actual ability of group members to use the diary method and to categorise their activity was carried out by the testing of the separate interpretations of episodes in which two group members took part and entered diary data . The amount of contact between individual group members during the studies was rather less than expected and it is not possible to carry out a statistical analysis . Only descriptive analysis is possible . Appendix 13.16 , for example , shows how the total number of episodes in which two pairs of managers are both involved were entered in diaries . [1] Profiles were drawn for the frequencies of decision-making and control activity , and the task of episodes . The origin of sources of differences was again examined by considering real differences in actual episodes and the paired data entered in the two diary records . Sources of differences were more various than in the earlier exercise considering diary / observation agreement . The absolute frequency of decision-making and control categories noted was important and in many cases one of the managers had been unable to find a suitable category .

Group Structure

Appendices 13.17 and 13.18 summarise the results obtained on the " structure " questions included in the end-of-diary recording questionnaire . The identification of the tasks with which each member of the group was involved has been made for all eight groups even though for three groups this data has been obtained from only one or two completed questionnaires . This was done because of the almost complete unanimaty in the responses from groups where there were numbers of responses which could be compared . Much greater variance was found for the second and third questions concerned with the decision structure . Results have been used from those groups where at least three end-of-diary recording questionnaires included responses to these questions . Data given in response to question four has been included in a separate appendix [2] .

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1. This is not just a test of the interpretation of categories by different group members . A number of managers indicated time pressure difficulties in completing diaries . Differences will also represent a factor related to retentivity .
2. Appendix 13.19 .

The structural information is considered under the two heads of the task and decision structure of the management units .

Task Structure of Groups . The basis for producing the list of tasks which covered the main organisational work requirements demanded of the group was the same in all cases . Although no identified tasks were actually common to more than a single group there are a nunber of characteristics of task lists which facilitate some comparisons . These task lists represent the groups' activities classified in a manner which does not relate to the job description of individual members . Any analysis using task lists must ignore the relative importance of the tasks included . A second difficulty is the variance in the absolute number of tasks which have were produced by groups [1] and the importance of retaining all tasks in structure analysis .

The effect of the actual task total in the identified list has been ignored in first analyses . These analyses consider the percentage of all tasks in the group recognised list which each individual is involved . Appendix 13.20 lists this summary . The groups have been arranged in the sequence of the size of the management units . There is an association between the number of tasks carried out by members of the same management unit . In addition , there is evidence from this summary that the actual size of the group is related to the common task numbers carried out in groups . A separate examination was carried out of the degree to which tasks are shared in the groups . The result found - that in smaller groups there is a greater sharing of tasks - is the same as was present for simulated groups and their tasks . However , it is not possible to characterise this apparently coherent difference in task allocation as a genuine structural difference . Significant differences in the pattern of task distribution may be a function of the characteristics of the relevent task lists for each group than a real structure factor.

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1. See list in appendix 13.1 . The range is not particularly great .

Decision Structure of Groups . The existence of the organisation external to the working groups studied requires the structure of decision-making in relation to each of the listed tasks must be considered in two distinct stages . This was specifically necessary to maintain the possibility of comparison with results from the simulated group study . The first question allowed group members to separate those tasks about decisions are taken within the " management unit " and those which may or are taken by members of the organisation not members of the management group . The second question was concerned with differentiating between members of the group who were merely involved in a listed task and those that actually were making decisions .

The results of the first exercise , listed as appendix 13.18 , show quite clearly that group members make consistent responses to particular tasks . There are distinct differences in the responses for particular groups, relating to both specific tasks and overall . For example , the degree of internal decision-making which can be exercised in groups designated as 03 and 08 is less than in the other three groups included in this analysis [1] . The listing of group members actually concerned with decisions [2] was produced from those member questionnaires which had earlier identified that the management group was totally or partly responsibily for decision-making with respect to specific tasks . The result confirms the result from the previous question : there are only three tasks over all five groups where the function of the management group is only to provide information for another part of the organisation . For all the remaining tasks decisions can be made within the the group [3] . There is no apparent relationship between the size of the management units and the participation in the various decision -making in listed tasks . Groups 03 and 09 , for example ,

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1. The distribution in all three categories of decision -making type responses supports this conclusion .
2. See Appendix 13.19 .
3. This is a confirmation of the independence of the chosen organisational units selected for study and supports the use of distinct organisation units in organisation research

with nine and three members , respectively , have totals of eight and eleven tasks which involve all group members in decision-making . A summary of the percentage of total tasks in which each group member took part in decision-making is included as appendix 13.21 . The most notable conclusion from this analysis is the skewed distribution in groups with most members [1] . There is also some indication of a frequency pattern found with particular groups . For example , groups 01 and 08 are similar but are quite different from group 03 .

The result from the second question was considered in the light of the previous identification of the individuals and totals concerned with general task activity in order to facilitate a direct comparison with the profile of decision-making in simulation groups [2] . Profile results are given in appendix 13.22 which also includes the summary over all tasks in the relevant group task lists . This has been done for the large groups included in the study [3] as there are some problems of confusion in smaller groups [4] between two of the categories . The pattern of response , both with respect to specific tasks and summated over all group tasks , in all three cases is within the range of values obtained from the BTA Exercise and listed tasks [5] .

Further analyses which had been carried out on the task and decision structure in the study using simulated groups [6] have not been duplicated here . The existence of different task lists , of different numbers of task in lists for groups , the identified relationship between group size and task structure , and the small sample would have led to inconclusive results .

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1. The direction of skew is constant . The majority of group members have a lower than mean involvement in total task decision-making .
2. See page 169 and appendix 9.25 .
3. With nine members or more .
4. If three members of a group were recognised as being involved in decision-making and yet only two of these were similarly identified as being concerned with task activity then two possible entries in the four categories are possible . This situation did not occur with the three selected groups .
5. See results for simulation study in appendices 9.28 and 9.29.
6. As in pages 170 - 172 .

The Organisation recognised Structure of the Management Groups

The source of the organisation-recognised structure description of the management groups which took part in the diary studies was the BEA Organisational Manual [1] . Each department head (that is , the most senior member of a management group) was allowed to see a proof copy of the page in this manual which refered to " his " department before final printing . He was expected to make alterations to either bring the material up to date [2] or to change the identified relationships between members so as to best represent the current " structure " . A measure of standardisation of the meaning of the number of levels and linkages indicated in these organisational charts had been achieved [3] .

Appendix 13.23 gives , in an introduction to the organisational description of the charts which follow , an explanation of the implicit meaning of the structure diagrams as used in BEA . Each entry in this appendix gives the organisational recognised structure during the actual period during which diary recording was carried out . All members of the unit are included in these figures - members who kept diaries are indicated . A number of groups adopted specific reference numbers for other members of BEA staff , <u>not actually members of the management unit under study</u> , with whom they had a great deal of interaction . These people have been excluded from these structures .

The limited amount of task and decision structure data obtained [4] from the end of study questionnaire was compared statistically with the " organisation structure " of each group . The organisational data has been considered in two ways . First group members have been considered in terms of their organisational status [5] <u>without reference to their position in the group</u> . The second series of studies examines only the <u>group</u>

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1. See page 208 .
2. Mostly concerning new staff appointed to positions .
3. In contrast to the various organisational interpretations of a " Manager " , " Superintendent " etc.
4. Relating to <u>eight</u> and <u>five</u> groups , respectively , of the total of nine groups in the study .
5. That is , manager , superintendent etc.

structure .

Appendices 13.24 and 13.25 give the frequency of the relevant number of tasks carried out and in which decisions are exercised . In each appendix the members in groups are categorised into six levels [1] of organisational status . The differences between the means of tasks for each organisational status level were tested for significance with an F test . Although differences are present between the means , only a single difference [2] is at a level of statistical significance . However , the set of results - from such a small sample and with many status categories - is indicative of a definite relationship between the number of tasks carried out by organisational members of groups and their organisational recognised status . A similar set of F tests were carried out with the mean values of the number of tasks with which management group members were concerned with making decisions . Although the mean values do differ , only one difference is significant [3] . The general conclusion to be drawn from this limited analysis is that the organisation structural description of management group members in terms of managerial status and the number of tasks in which decision can be exercised are related .

A number of additional concepts of organisational structure become relevant when the management units used in the research are considered as separate organisational entities . Each group has a distinct number of recognised status levels . There are also specific numbers of group members at each of these levels . Finally, there is a recognised " linkage " between group members which is partly determined by group status but which is also defined by unclear task and decision relationships between pairs of group members . Before statistical analysis was undertaken the general correspondence of the organisation recognised description for groups was examined descriptively . The results of the end-of-study questionnaire were directly compared with the organisation

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1. Senior Manager , Manager , Superintendent , Senior Officer , Officer , and Supervisor .
2. Between the Manager (n is 10) and Officer (n is 19) populations . F ratio is 7.13 .
3. Again between Manager and Officer populations . F ratio is 8.50 .

recognised description . The result of this preliminary examination [1] was to confirm that , in general , the decision structure could be predicted from a reference to the network of status " linkages " in each group . However , the task structure was not predictable from the status network . These results indicate that the traditional organisation structure of management groups tend to represent the decision structure with reference to tasks rather than the task structure in the group .

Two further examinations of the relationships between the " traditional " group organisational structure and the task and decision structures were carried out . The organisational group level of each group member was considered . In order to facilitate comparison between groups the senior person [2] in each group have been assumed equivalent and other members of groups classified according to their charted relationship . The number of levels in the studied groups varied from two to five [3] . Appendices 13.27 and 13.28 give the task and decision structures of each group parallel with the classification of group members into their group " level " . These results can be directly compared with the corresponding charts constructed from the knowledge of the organisational status in appendices 13.24 and 13.25 . The limited statistical analysis possible [4] indicates a greater significant difference of the indicated means than present in the " organisational status " charts .

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1. Appendix 13.26 gives a graphical example for management group number 03 .
2. A similar kind of assumption made in the sepcification of organisational levels is present in the J. Woodward (1965) study . Pages 12 - 13

   " - the chief executive could be the chairman , managing director , or general or works manager - . In every case he represented the highest level of authority operating full-time on the spot . "

3. The size of the groups was roughly proportional to the number of levels present .
4. Limited by both the small size and the variation in the actual tasks listed for each group .

This limited statistical analysis suggests that group task and decision structures , as defined and used in this research relates more to group than organisation recognised structure measures . Further relationships between recognised structure[1] and the task and decision structure were not found .

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1. Number of members at each level and the " linkages " between members .

Part Three : The Activity of Management Groups and the Relationship between Group Structure and Activity .

This final part of section four of the thesis considers the results obtained from the diary records kept by members of the organisational groups studied in B E A . A section dealing with the direct activity results is devided into three parts corresponding with the main sectors included in the diary recording scheme . These are :

Patterns of Interaction of groups and group members

Decision-making and Control function of total activity

Pattern of activity related to Tasks

Under each head results are compared with analogous results and conclusions in the simulation study.

The consideration of the association between group structure [1] and the measured group activity makes up the final part of this chapter . The type of analyses carried out , and the manner in which data is treated , is dependent upon the requirement of comparing with corresponding results found with structure and activity in groups using the BTA Exercise as a basic task .

Patterns of Interaction of Groups and Group members

Appendix 13.2 , besides giving the summary data obtained from each group members' completed diary , presented a simple schematic of the actual totals of interaction [2] between members of the studied groups and of each persons total contact with people outside the group . This first analysis considers this information about the individual's and group's pattern of interaction without reference to any other characteristic of the contained episodes they represent . This analysis in appendix 13.2 is distorted

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1. Including both the aspects of group structure which are part of this research model and those more organisational recognised measures .
2. Representing totals of episodes in which various other people were involved .

because the totals entered in the figure represent the higher figure recorded by the pair of managers involved . Additionally , the total records for each member are quite different in length and , in some degree , completeness . A summary figure was derived for each group member which gave the relative frequency of contact with other people in relation to the frequency of episodes recorded . As with the corresponding phenomenum in the simulated groups [1] the summary of rate of interaction is expressed as the number of episodes in every hundred which were noted as involving another [2] person . A preliminary distinction was made between contact within and contact outside the recognised group involved in the various studies[3]. Frequency histograms of total , and of itemised within and external , interactions are shown in appendices 14.2 and 14.3 , respectively .

The first conclusion to be drawn from these descriptive histograms is the relative frequency of interactive episodes [4] varies very considerably amongst the group member population [5] . The results for the two contributing sets of interaction , within and outside the group , are very different from each other . Contact with organisational members who are not members of the group contributes the greatest proportion of total interaction of group members . Contact between group members contributes a generally smaller number of interactive episodes [6] . Appendix 14.4 gives a regression of the results of individual members for outside and within group contact . There is no obvious relationship between the two sets of results for interaction . Contact of members with other group members seems independent

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1. See , for example , appendix 10.6 .
2. Summarised in Appendix 14.1 .
3. In the simulation studies a similar preliminary distinction had been made between individual and interactive episodes .
4. Roughly also the percentage of time spent in interacting with others .
5. From around 15 to 95 % . Previous studies of managers interactive percentage have been between 50 to 75 % .
6. In the diary records of only four group members was internal contact greater than external contact .

of the amount of contact group members have with organisational members outside the studied group .

The data relating to the number of contacts of group members with people outside their own groups is approximately normally distributed . An Analysis of Variance was carried out for the data from the eight groups studied . The results are shown in appendix 14.5 . An F test indicates that the differences between means is just significant [1] even with this low sample . Approximately 70 % of the actual variance in the frequency of contact that members of each particular group has with non-members of the group is associated with some common " group " factor . As the frequency of within and outside group contact for individual members has been shown unrelated it is therefore possible to deduce that a common " group " factor is unimportant in determining the amount of interaction each group member has with other members of the group [2].

These results relating to the independence of the internal interaction and the frequency of individual activity parallels exactly the results found for the simulated groups . However , the absolute frequency of interactive and individual episodes for group members is significantly different from the results obtained from the BTA Exercise groups . Appendix 14.6 is a comparison of the results found for the simulation groups compared with the results found for the members of management groups [3] . If the interaction outside the groups is included the correspondence between the individual / interactive frequencies is much greater . The range of means found for the management groups is greater than that for individual groups in each of the four simulation groups . This may be due to the difference in the tasks required of groups in the organisational sample . If this is the case than the effect must be through the frequency of each group members contact with people outside the group as this is

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1. At the 0.05 level .
2. This was the result found for the simulation groups - see pages 175 - 176 .
3. Mean data related to the four group size samples are included in appendix 14.6

the only category of activity which is related to an apparent " group " factor .

The tests of the reliability of group members' records had used an index representing the mean number of people involved in interactive episodes [1] . The finding that diary records for each individual records have a constant index - which is significantly different from the corresponding index for other members of the same group - seems to contradict the results that the greater component of interactive episodes [2] is found highly dependent on a constant group factor . This can be explained by the result that the interactions which involve members of the person's own group tend to contain more participants than interaction with organisational members who are not part of the studied group . The contact with members of the group , known related to individual factors , contributes the greater part of the variance in the index measure of mean number of organisational members in episodes classed as interactive .

Decision-making and Control purpose of Activities

An earlier appendix [3] included the totals of each decision -making and control category frequency in each of the diaries of group members . Because of the different numbers of total episodes included in diary summaries percentage frequency of each category in the total of number of episodes was calculated [4] . This summary was produced for eight of the nine groups for which completed diaries were obtained [5]. Before this data was considered for individuals and for groups preliminary histograms showing the relative occurance of each category over the total diary population were constructed [6] .

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1. See page 216 and appendices 13.12 and 13.14 .
2. That is , interaction with organisational members who are not part of the management unit under study .
3. Appendix 13.2 .
4. The separate frequencies of each category in the model of decision-making and control are shown in appendix 14.7 .
5. The group providing only one diary was not included .
6. Appendix 14.8 .

The results for the categories with a significant occurance have been included [1] . For three categories the relative frequency in episodes recorded in diaries is quite low [2]. The remaining four categories [3] have much higher means and approach normal distributions . The mean values , the variance and standard error of means for the four categories with near normal distribution were calculated [4] .

These results for total distribution of decision-making and control categories in episodes were compared with the corresponding figures found for the simulation groups . Two profiles were drawn of the relative frequencies of each categories for all episodes in the simulation study and the management group study . The results are shown as appendix 14.10 [5] .

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1. A total of seven categories in the model of activity .
2. Below 10 % of all episodes . These categories are : Setting Goals , Identifying Outcome , and Evaluating Outcome .
3. Clarifying Problem , Identifying Action , Choosing Action , and Effecting Action .
4. Appendix 14.9 .
5. The data representing the simulated group members activity records is abstracted from appendix 10.6 which gives the separate profiles for individual and interactive classified episodes .
   The activity information relating to the decision-making and control categories present in episodes during the management group study has <u>not</u> been hierarchical considered in terms of the type of episode (that is , individual , within group interaction , and outside group interaction) . The results from the earlier researchwith the BTA Exercise groups had indicated a difference of significance between the frequency of various categories in the individual / interactive episodes . This research does not include an analysis of the differences in the decision-making and control content of the types of episodes . The manner in which the original data had been summarised made analyses of this kind impracticable . A small sample study of a single diary suggested that differences between the frequencies associated with episode-types were less than those in the simulation group results .

The comparison of individual frequencies for the two sets of groups indicates some similarities and differences . The overall frequency of all decision-making and control behaviours are similar and the individual frequencies for five categories are similar in the simulation and management group studies [1] . Very large differences exist for three categories [2] .

A spearman rank correlation exercise was carried out on the relative frequencies of each decision category with each other decision category in the model for the summarised data for each member of the management groups . A similar multi correlation had been performed with the frequency data contained in the observation records . This data had been considered at the group frequency level and the level of individual frequency[3]. The results of the correlation for individuals' frequencies of decision-making and control activity is shown as a primitive " cluster " in the same manner as the group data from the simulation study observations[4] The correlation data contained in the earlier analysis of the individuals in simulations [4] was compared with the results from the diary records for individuals for those behaviour categories which were common to both [5] . In both the observation records for the simulated groups and the diary records for the management groups there is a " main-stream " of decision activity from Clarifying Problem to Choosing Action . The frequencies of other categories in the model are quite different-apart from having the common phenomenum that they are not correlated with this series of five categories in the model of decision-making and control .

---

1. Setting Goals , Choosing Action , Sensing , Discriminating and Setting Standards .
2. Clarifying Problem , Identifying Outcome , and Evaluating Outcome .
3. See appendix 10.11 . The frequency data had been separated into individual / interactive and size of group hierarchies which had reduced the number of categories which were included in the analysis .
4. See appendix 10.12 .
5. Summarised in appendix 14.12 . A mean figure from the simulation six contributing correlations has been included .

These results show that, although there are considerable differences between the frequencies of the activities in the model in the simulation and the management groups [1], the pattern of occurance and association between category frequencies in individual summary results are quite similar .

Before the summary data from groups was compared with the previous results for the groups in the BTA Exercise an analysis of variance was performed on the category frequencies Table one in appendix 14.13 can be directly compared with corresponding table showing simulation group frequency means in appendix 10.8 . A two-way analysis of variance performed on this table of frequencies indicated that :

> Variance between managerial group behaviours (column means) was very highly statistically significant . The diary system of behaviour recording is succeeding in characterising some aspect of behaviour which has some constancy in different groups .
>
> Variance associated with behaviours between groups is very close to general statistical significance [2] .

Detailed F tests were carried out for those decision categories which had been shown approximately normally distributed [3]. The obtained ratio for one category is significant and another approaches significance [4]. The order in these three categories as to the degree to which within group factors can be held responsible for group results is in agreement with the more substantial rank list [5] for the simulation groups .

---

1. The results for some individuals and groups are within those found for simulation groups .
2. 1.91 compared with a required value of 2.16 for significance
3. Decision categories : Clarifying Problem , Choosing Action and Effecting Action . The results are given in appendix 14.14 .
4. Ratios are 3.01 and 1.90 compared with the 0.05 level value of 2.33 .
5. Especially the importance of a group factor in determining the frequency of clarifying problem activity . See the earlier appendix 10.10 .

Patterns of Activity related to Tasks

The task list which comprised the BTA Exercise had not been used in analyses of individual and group activity in the Simulation studies . The listing of various component tasks implicit in the BTA Exercise had been carried out to permit the derivation of simple task and decision structure measures . A separate analysis here of the task characteristics of recorded episodes found for individuals and groups is necessary for the following reasons :

1. The relationship between the actual task lists and the total task of the management group must be clarified - both in general and with reference to particular groups .

2. The corresponding relationships of the group task lists with the BTA list must be examined .

3. A wish to prepare task designations of individuals' and groups' task activities with structure data relating to task and decision .

All the selected task lists for groups seemed adequate in use although a number of the groups developed one or two additional task categories [1] .

Appendix 14.15 summarises the total number of different tasks with which each group member in the diary-keeping management units had registered in his record . A wide range of total number of tasks identified is present . A second preliminary analysis of all diary records was to examine the absolute importance of the most frequently used management group task in all records . Another wide range of the frequencies of the most important [2] task category was found [3] . A supplementary test of the relationship between the number of tasks used by a group member in diary recording and the

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1. Each management group had been advised that additional tasks might prove necessary . Additions and changes had to be agreed and implemented by the whole group .
2. In absolute frequency .
3. Shown as a histogram in appendix 14.16 .

frequency of the most used task category in records was carried out . Contingency table in appendix 14.17 shows that, although there is a tendency for group members with low numbers of tasks registered to have a task which is particularly frequent, - it is comparitively slight .

The degree to which the listed tasks for a particular group can provide an opportunity for differentiating and comparing tasks carried out by group members is dependent not only on the specific task list produced but also on the real characteristics of the tasks being undertaken by a group . A failure to have tasks which can be seen differentiated over group members may have , as its origin , the actual nature of group tasks . One indication of the success of the lists [1] is the task profile for the whole group showing the use of tasks included in the task lists . A set of profiles were prepared [2] giving this information . The apparent importance of the most frequent task is paralleled by the only gradually diminishing importance of successive tasks arranged in frequency rank order . A " cumulative contribution " graph - indicating this successive exponential distribution - was constructed for two groups [3] . In these two , dispite the total of twenty-two tasks included in the list , only four and five tasks have been found with more than half the total recorded episodes for the group . Similar results were found for the remaining groups included in the study .

Nevertheless , there is evidence , from the profiles included in appendix 14.18 , that the task lists for groups did not automatically preclude the possibility of tasks associated with separate individuals being significantly different and of use in structure / activity analysis . For three groups (01 , 02 , and 03 [4]) the lists were somewhat less adequate as the frequency of " other tasks not included in the list " was high .

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1. But which includes the implicit requirement for real differentiation of task required of the management unit .
2. Appendix 14.18.
3. Appendix 14.19 . The two groups with the highest total of contributing diaries were chosen .
4. These were the first three management unit studies carried out in BEA .

The data contained in appendix 13.2 relating to the summaries of the use of task lists by each member in recording his episodes was more usable by the development of the percentage frequency of this use of each task with reference to all recorded activity . The derived data giving these percentages [1] is shown in appendix 14.20 . This data can be examined in many different ways - both graphically and statistically [2]. However our main interest in this management group study is between structure and activity measures rather then the further development of task characterisation and comparison of task present in different activities . Two related analyses were performed . The first considered the actual total number of people in each group who were actually concerned with particular tasks . The second analysis attempted to consider the pattern of the " sharing " of activity with specific tasks amongst members of groups .

A table of the number of people in each group against the actual number of people carrying out each group listed task - as identified in episode records - for each task was constructed [3] . This simple display of the data contained in appendix 14.20 confirms that the tasks included in the group tasks lists are carried out by very different totals of group members . There are no apparent trends in the pattern of concern with tasks as the size of the management groups used in the studies increase . A second analysis examined the actual distribution of total episode amongst each of group members identified with that particular task . Specific tasks with distinct numbers of group members found engaged in their activity were selected . The " sharing " of the group members concern with tasks was compared between different management groups . This analysis was applied to tasks with two and three group members engaged in activities [4]. There were no consistent differences in the pattern of activity with different tasks in different groups .

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1. The total percentages - frequencies of number of task categories in 100 episodes - are also included .
2. But the conclusions which can be drawn from such analyses are constrained by the differences in the actual task lists in various management groups .
3. Appendix 14.21 .
4. Only tasks with two or three members were relatively common in the management groups .

Group Activity and Structure

In the final section of this chapter is included an examination of the relationships between characteristics of measured group and individual activity and both structure measures as defined in this research model and other group and organisation recognised management structure . The two important activity descriptions which have been used in this analysis are the total pattern of activity [1] and the summary content of activity classified according to a model of decision - making and control [2] .

The pattern of interaction [3] of group members comprises the relative frequencies of episodes which contain either contact with another person within the group and another person outside of the group in which studies were carried out . The separate frequencies of these type of episodes for individuals has already been shown to be unrelated . In addition the values of the frequency of contact that members of a particular group with individuals outside that group has been shown dependent on a factor which is common to all the members of that group [4] . In spite of the known non - normally distributed frequency of contact with persons within the group , a regression of the frequency of contact with the number of tasks that each person was carrying out was constructed . An examination of the result showed that, apart from approximately seven very distinct deviances, a correlation between the contact with other members of the group and the number of tasks carried out existed [5].

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1. Included in the Simulation examination of the structure / activity relationship - but excluded here - are : consideration of second-order structure measures , differentiation of task members on the basis of specific tasks . See pages 196 - 199 .
2. The differences in contents of individual / within group and inside group interactive episodes has not , as in the BTA study , been considered .
3. Interaction replacing Activity here as individual episodes are not considered in detail in other analyses .
4. Which suggests that this measure can only be associated with a structural measure which is common to the group.
5. This result is to be expected as increasing tasks implies increasing numbers of shared tasks .

Three points on this regression were grouped together . On examination of the other features of the group members represented by these points it was found that they were , in each case , the most senior man in that specific group. The other four points were group members who had recorded no contact with anyone outside the management group . While not rejecting the data relating to these seven group members, they were excluded and a second regression analysis was performed[1]. The result , shown as appendix 14.22 , indicates that increasing numbers of tasks associated with group members is indicative of greater contact with other members of the group . An analysis of the actual contact between specific group members and the degree to which their group tasks are " shared " was not carried out [3] .

A relationship between the frequency of contact with organisational members not members of that particular group and the number of tasks carried out by individuals is not expected because of the non-correlation between within and outside contact frequency for individuals . This result was found .

The relationship between the decision structure and the pattern of activity was considered at two levels . The first considered the total relative frequency of types of decision-making which had been identified by all the members of single groups . In the analysis of decision-making types found for groups in the BTA Exercise Ranking statistics had been possible because of the numbers of group results . This preliminary analysis merely displays the frequencies of contact of members of specific groups with people outside that group arranged over a dimension which represents the total type of decision structure found for that group [4].

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1. The removal of these seven values makes the distribution quite close to a normal curve . See appendix 14.3 for the original histogram .
2. Without considering the total , and different , numbers of tasks which have been produced for each group .
3. The great majority of tasks carried out by members of groups are shared with , at least , one other group member . The co-incidence of appendices 14.20 and 13.17 effected this decision .
4. This is explained in the appendix (14.23) . The decision - structure information is obtained from appendix 13.18 .

There is no direct association of the range of frequencies found for groups according to the general " type " of decision -making structure of these groups . The frequency of interaction of members of a particular group with other organisational members , which is found dependent on a common " group " factor , does not have the decision structure as a simple source of variability .

A second series of studies using the decision-making structures obtained from the end-of-diary study questionnaires considered the specific number of tasks with which each separate group member was actively involved in making decisions . A series of correlations coefficients between the two classes of interactive frequency for members and this individual measure of decision involvement were calculated [1] . As no indications of statistical significance were obtained more demanding tests were not proceded with [2] .

The data of the frequencies of decision-making and control activitiy classifications had been found to contain a substantial group which approximated to normal distribution . The relative frequency analysis of the categories in the model had indicated that the series of categories from clarifying problem to choosing action [3] to be relatively highly inter-correlated [4] .
First analyses considering these two decision-making categories [5] are a simple series of correlation coefficients calculated from the number of tasks and the number of tasks in which decision was exercised . The results supported an absence of correlation . In particular , there was no relationship between the correlations of the two decision-making categories with the same structure variables [6] .

---

1. Pearson test was used in spite of the nature of the data used .
2. That is , non-parametric tests .
3. Including , Identifying Action , Identifying Outcome , Evaluating Outcome .
4. See appendix 14.11 .
5. The management groups were considered as two populations that is , in order to increase the requirements needed for finding a common relationship .
6. The frequencies of clarifying problem and choosing action being known intercorrelated .

The mean frequencies of the various categories of decision-making and control activity found for groups (appendix 14.13 was compared with the percentage of group tasks which could be identified as either decision-making or supplying information [1] . The core activities in the decision-making model were examined in the same manner as appendix 14.23 . No relationship between the relative mean frequencies of these behaviours and the percentage of tasks with which internal decisions could be taken by the group was found .

The last analyses carried out between the recorded individual and group activity and the structure of the groups considered the organisation and group recognised structures [2] . Tables of the within and external interactivity by each member of the groups were constructed which represented the two separate group and organisation classifications of the status of members of the group [3] . For each status level in each table the mean was found . While the different number of group members falling into classifications varies there are trends which are found in both tables . The higher the organisational or group status the higher is the total frequency of both within group and external interaction . As can be predicted from the finding that the interaction of a particular group with the organisation is dependent on a group factor this trend (of diminishing interaction with others associated with lesser status) is more pronounced with the within group classified interaction . The results of a Wilcoxon test , applied to various combinations of status in the separate tables,are shown in appendix 14.26 . The coefficients support the conclusions obtained from an examination of means . There is a general correspondence between the results found for the two organisation and group classifications and the differences are consistent with the real differences caused by samplesizes.

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1. As described in the last chapter on the structure of the management groups in BEA .
2. Using the same classification as in appendix 13.25 and 13.27 .
3. See appendices 14.24 and 14.25 .

Further analyses , using the distinction between organisation and group recognised status , consider the relative frequency of the decision-making and control categories . A similar preliminary procedure to that adopted in considering the task and decision structure of the group was adopted [1] . The two tables of the classications given the frequencies of clarifying problem and choosing action categories for every group member were constructed [2] . A Wilcoxon statistic was produced between the various selections of group members for each decision-making category using the two methods of classifying group members position according to organisational or group role . The results are shown in appendix 14.29 . The limited conclusions to be drawn from this analysis is that that the results obtained from both " methods " of classifying structure are similar and that the apparent differences in the frequencies of both behaviour categories in structure classifications are nearly the same .

The amount of data relating to the frequencies of decision-making and control activity did not make possible further series of structure and activity correlations as had been possible with the results from the simulated group study .

Summary of Results from Sections Two , Three and Four [1]

The two preliminary studies described in section two had , as their primary objective , the evaluation of three propositions concerned with organisation theory and practice . These were :

a. That groups taking part in a complex business exercise appear to have close verisimilartude to subunit groups found in real economic organisations.

b. The tracer method used in a non-manufacturing organisation is a useful organisational analysis instrument .

c. That relationships between organisational control systems and organisational structure can be examined by use of this method .

The results from the first organisational study showed that the tracer method , as used , was not capable of producing data which would provide for other than descriptive research . By contrast , a method of examining the control and decision-making activity of individuals , as opposed to decision and control systems , had shown reliable and significant results . The stable nature of many structural and performance features of the simulation groups had suggested the more extensive use of this type of group in organisation research .

A theory framework was developed [2] which indicated the organisational unit of the group not only as the main construct but also as the appropriate level at which to collect structural and activity data relating to individuals members of large organisations . The results of the second series of studies using a model of group membership , structure , activity and performance considers specific results under these separate heads and a further section dealing with tested relationships between variables in these group concepts .

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1. This summary contains only abstracted results and conclusions of the primary group functioning model proposed . Some important null hypotheses results have not been included here .
2. As described in Section 1 of this thesis .

Membership variables were only obtained for the groups in the simulation studies . All measures used were well recognised in previous research . Groups in both the simulation and the management group studies were successfully described in the research developed group structure measures of task and decision . A considerable range of scores on these measures were found in both group sources . Scores found for members of the same group (simulation and real management groups) have less variance than that between groups . The developed measures of task and decision structure associated with individuals in management groups have been shown related to the organisation and group[1] recognised strucural descriptions of individuals .

Activity measures used in the research included both a categorisation according to the model of decision-making and control activity related to tasks and the simple distinction of members' activities into individual and interactive activity . In the simulation groups the frequency of activity classified as individual for each member of a group was found related to some common group factor . The general pattern of individual and interactive activity frequency in BTA groups closely parallels the corresponding frequencies in the actual management groups in BEA . The contact of group members with organisational members not members of their own particular group is higher than intra-group contact . The contact with organisational members outside the group is dependent on some common group factor . By contrast the communication amongst individuals in the same group is unrelated to the group of membership .

The decision-making and control content of individual and interactive classed activities have been found significantly different . The differences are , in practice , very small . The frequencies of the various categories making up the activity model show large absolute variation in both the simulation and the management groups . Members of the same

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1. Relationships with the group-recognised structural descriptions were more significant .

group have significantly similar frequencies of particular behaviour categories . The relative frequencies of the decision-making and control classified behaviour show similar inter-correlations in results for individuals in both simulation and BEA management groups . In particular , a sequence of highly correlated categories exist for both research populations of groups .

Performance measures were obtained in the simulations studies Financial success in the BTA exercise was shown to be independent of the other groups in specific course and their relative financial performance . The final cumulative performance as measured by the profit achieved was found to be highly correlated with a measure of initial financial performance in a trial situation . This initial financial result is not carried forward to the simulation exercise proper . A final result from an examination of the financial performance of groups was that the results for three implicit sources of group members , as illustrated best by a regression analysis between initial and final cumulative performance , were , within limits of statistical significance , identical . Two performance measures were developed for use in inter-correlation analyses . These were the initial financial performance measure and the change in profit during the exercise [1] .

Comparison of results for the inter-correlations between variables in different concept sets for the two group studies was effected by the low number of results for the research in BEA management groups . This applies particularly to considerations of the summary measures relating to the whole group .

The initial profit index was found significantly related to the set of psychometric variables of age and intelligence [2]. The index was also associated with higher frequencies of the setting goals and standards activity types . However no group structure measures were singificantly correlated with this performance measure .

---

1. Change in Profit corresponds to the difference between the actual final cumulative profit and the cumulative profit predicted from the initial trial profit from an application of the general regression equation .

2. AH 5 , Pym Flexibility and 16 PF factor B .

In contrast , the psychometric variables have been shown unrelated to the change in profit measure . Many structural measures are very close to actual statistical sigificance . The greater the number of tasks carried out by members of groups and the wider the actual range of numbers of tasks the more likely is the group likely to improve its financial performance compared with the trial result . In addition the number of people engaged on <u>specific</u> tasks is statistically significant . The activity categories of clarifying problem through to evaluating outcome [1] correlate with improving financial performance by groups .

Relationships exist between psychometric results and the developed measures of group structure . Increasing scores on AH 5 , Pym , Q_1 and Q_2 for groups are associated with high mean numbers of tasks carried out by group members . Q_1 and Q_2[2] are similarly related to the type of decision -making found in groups . These results support the lack of relationship found between these two measures separately and the performance measures . The frequencies of activity categories found for individuals was not connected with any measure of membership .

The final set of inter-correlations , between group structure and group activity , were carried out in both the simulated and the management groups . The amount of individual and interactive activity associated with individuals is related to the size of groups and the actual type of tasks carried out by individuals . The frequency of decision-making and control activities , in both BTA and BEA management groups , is <u>not</u> related to any structure measure [3]. In the Management groups within BEA both group and organisation recognised structural descriptions of individuals give correlations with the relative separate frequencies of within and external group interaction .

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1. Which have already been shown to be highly significantly inter-correlated .
2. Increasing conservative and self-sufficient scores .
3. Including the decision-making type valid for each group .

Structure and Activity of Task - Directed Groups .

Volume II Appendices and Bibliography

Faculty of Engineering

University of London

1973

APPENDIX 1.1

Organisational Research : Facilities and Use of Results

In all research requiring the testing of hypotheses the provision of field facilities is essential . In research in organisations the obtaining of real facilities for the testing , development of theory and measuring instruments is a particularly difficult operation . In this research a decision was made to design the form of the research so that it would be possible to carry out studies within a single large Organisation . This restriction to a single organisation does restrict the type of research which can be carried out - however , the decision reached in the first year of the project to focus on the management sub-unit of the group , was independent of the use of a single organisation for field testing .

The research described in this thesis was financial supported by the organisation in which this series of studies was carried out . This support was in the form of a Research Fellowship over the three years in which the studies continued . No agreement was concluded with BEA at any time in the the duration of the research about the actual facilities which could be made available by the organisation . In every case where either members or parts of the organisation were studied agreement was first sought from the relevant members . The progress of the study was , except where mentioned in the text of this thesis , not influenced by any limitation on areas of study within British European Airways .

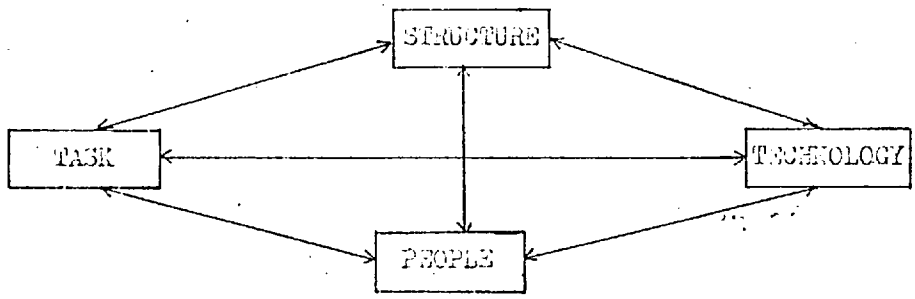
Paragraph 2 of the research agreement with British European Airways states :

" The research will be useful to the Corporation "

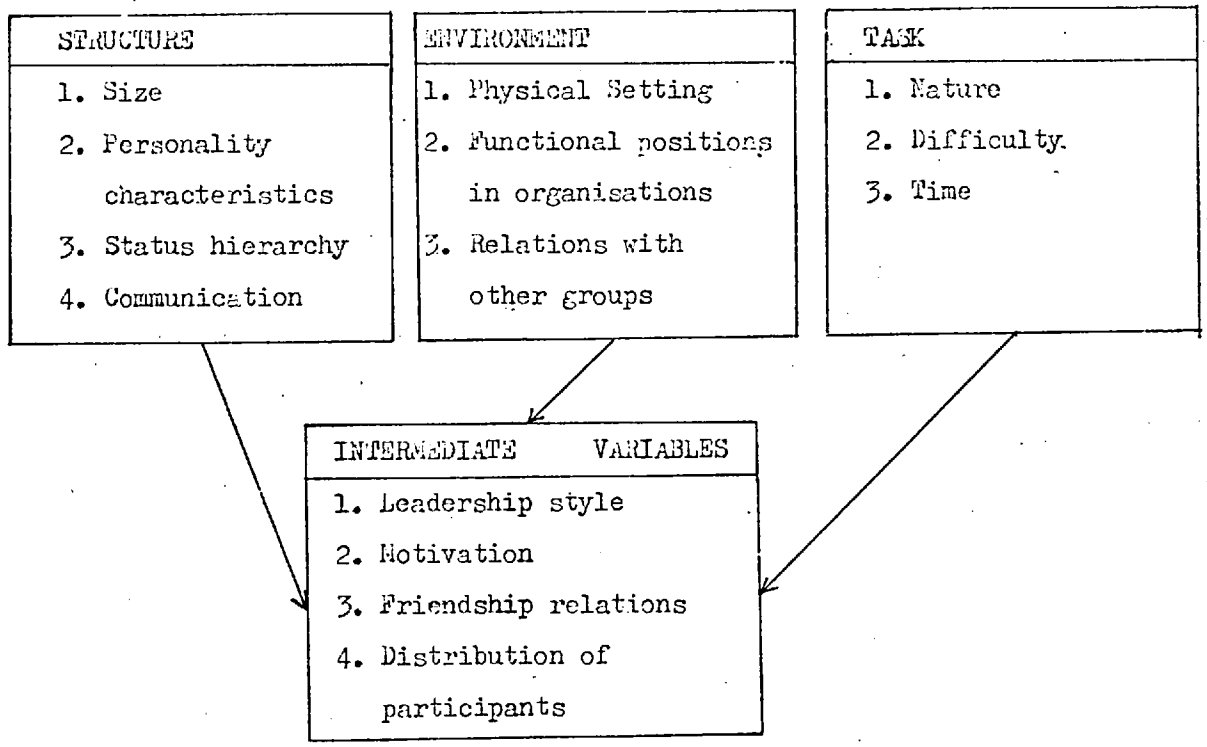
In the light of the debate on the objectives and the usefulness and use of research - and the special importance of the role of " Action Research " in real organisations - it essential that the meaning of this paragraph in the study sequence is clarified .

The interpretation of this paragraph , by both the researcher and BEA , was that the end-product of the research should be of use by either BEA in total or by smaller sub units within the corporation . It was accepted that neither the original objectives of the research or the progress of the research studies should be controlled so as to maximise the benefit to be gained by the organisation . At no stage in the series of studies was an action research introduction of change into the existing situation either proposed or carried out . A single problem did arise . The business exercise used as training device by BEA was found invalid as a training device . The use of this business exercise continued for at least a year after evidence had been found of its unsuitability as a development tool . However , as the training programme was decided for periods of up to eighteen months, non-intervention by the researcher had no real negative effect on the organisation and organisational members studied in the training environment .

Models of Groups and Organisations



After Leavitt (1965)



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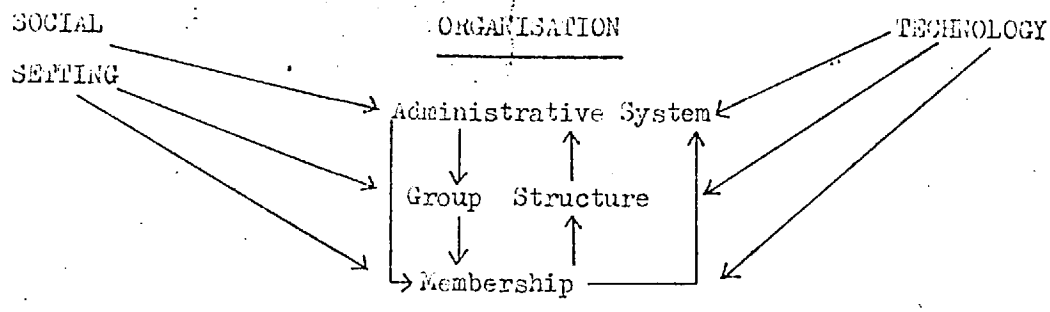
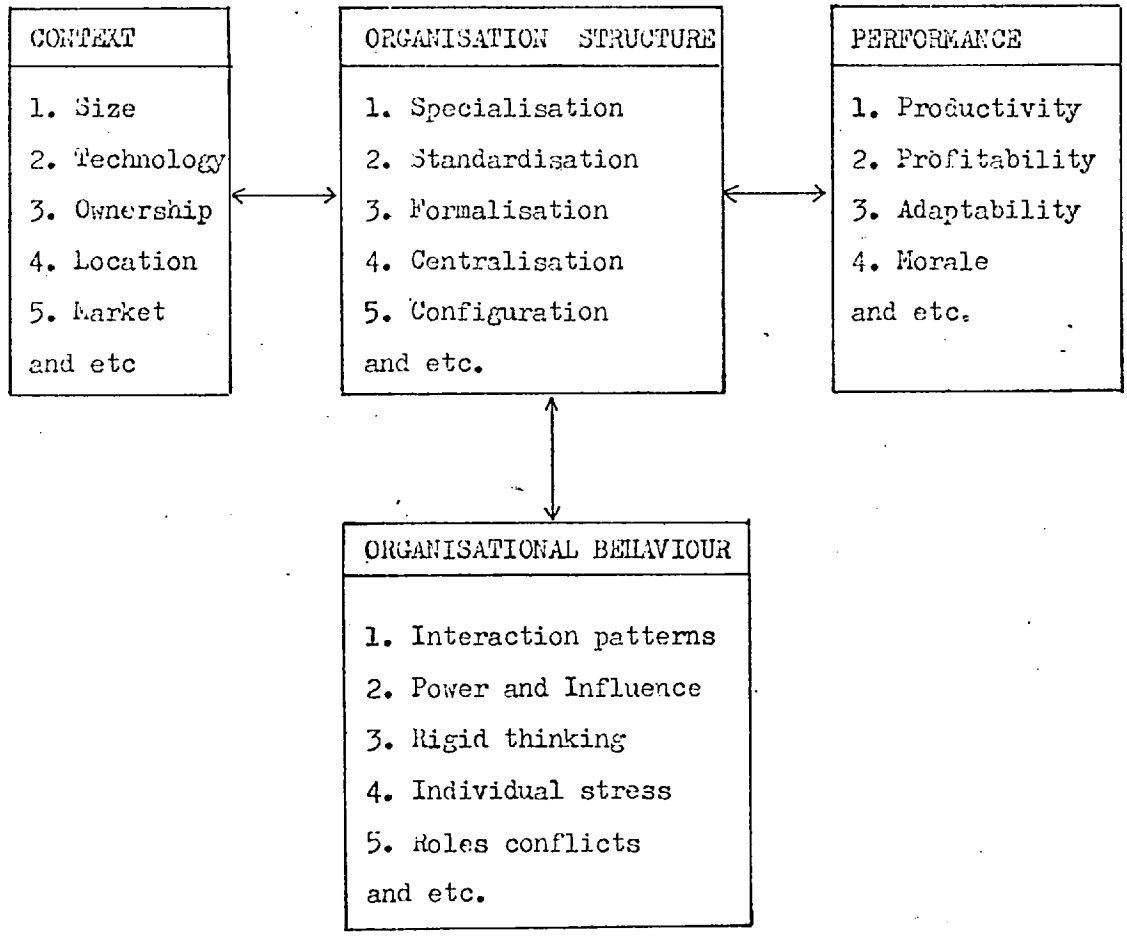


S.H. Udy (1965) page 688



D.S.Pugh and D.J.Hickson (1968) page 395

APPENDIX 2.2

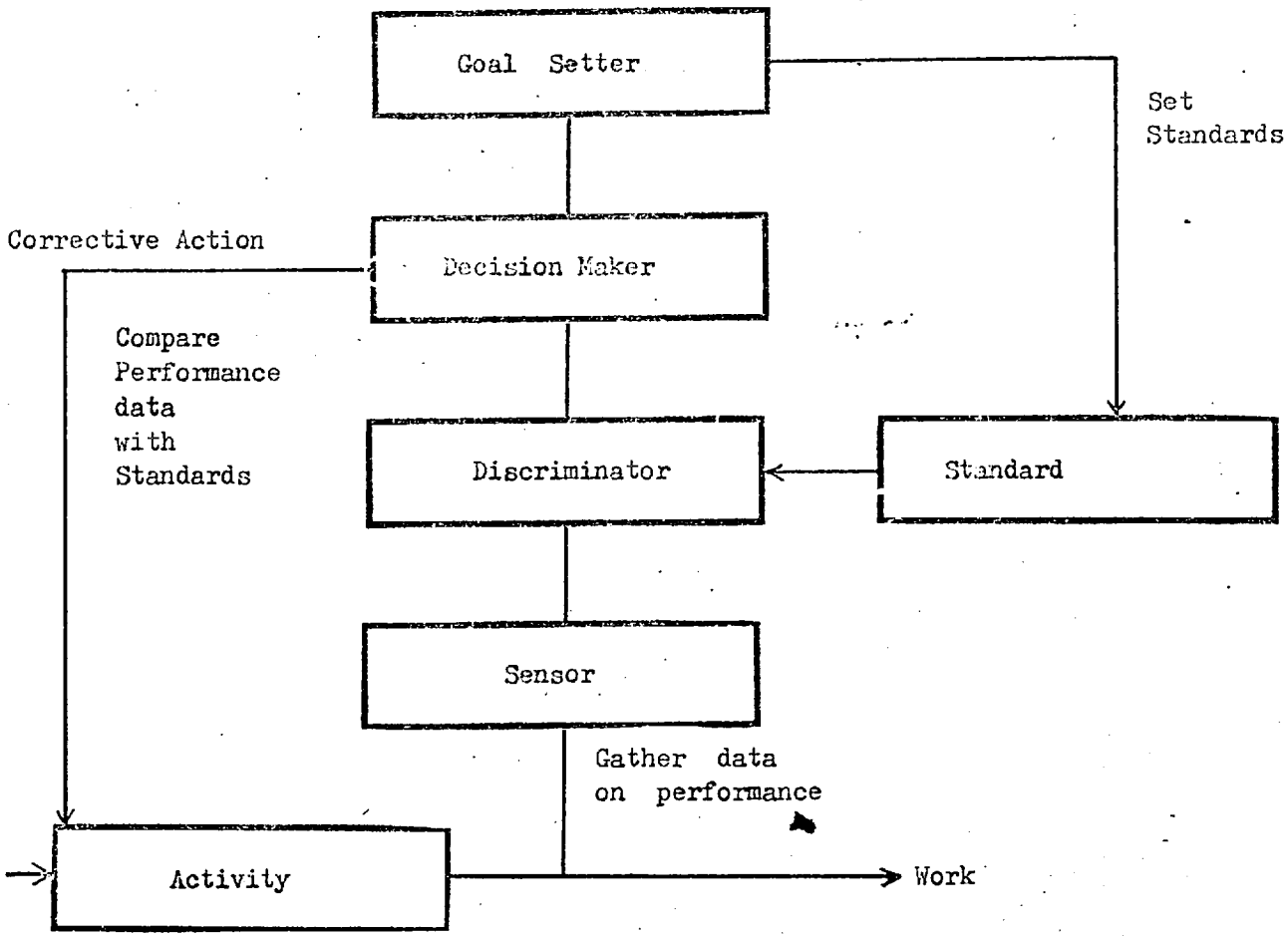
Model of Organisational Research used by Woodward and associates

TECHNOLOGY	STRUCTURE	PERFORMANCE
1. Categorisation of the production systems 2. Product standardisation index (from 1967)	1. Membership characteristics. For example , skills of production worker, proportion of manual workers skilled , employment of graduates 2. Organisation structure. For example , the number of hierarchical levels , "span of control" of chief executive and first-line supervisor 3. Organisational activity identification of the predominant mode of communication .	1. Categorisation of organisation's business success as average , below and above average .

INTERMEDIATE VARIABLES
1. Control systems instituted by a organisation to deal with the problems thrown up by the nature of the production system .

The model of the Imperial College research is relevant for the date when the framework of the BEA research was designed and the major part of the fieldwork involving both simulation tasks groups and real organisation groups had begun . The tables 7 and 8 pages 346 and 347 in J. Rackham (1968) contain the most comprehsive summary of variables and results . The Imperial College project 1967 / 1968 is described in " Research Supported by the S S R C (1967)".

Representation of a Control Cycle (after Litterer(1965) p.237)



APPENDIX 4.1

British European Airways Operations in Germany

Historical Background to the Tracer used in 1966

BEA , in Germany , operates a " domestic " type airline , with operating rights between certain important German cities and Berlin . Under the post-war four-power agreement between the Allies about Germany only aircraft registered in the Allied countries and flown by personnel of the Allied countries were allowed operating rights into and from West Berlin . German airlines were specifically excluded from operating into West Berlin . The rights of airline operations into Berlin were specified to some extent in the original four-power agreement - but a commission with a continuous existance in residence at Berlin approves and monitors day-to-day operations .

BEA , Air France and Pan American Airlines began operations into Berlin shortly after the war - the traffic in these early days being mostly of military personnel . The traffic reverted to normal business and holiday traffic during the nineteen fifties . The separate military separation of Germany into three western sectors decided which airline operated from that sector into West Berlin . The southern routes were dominated by the American airline , while BEA enjoyed an advantage in the B A O R district . The patterns of routes which existed in these early days still had a definite effect on the operational structure of the airlines in 1966 . The prime example is the two monopoly routes which BEA and Pan American Airlines still retained . BEA was the sole operator on the Bremen route and P A A , likewise , on the Nuremberg route .

BEA and P A A have both had a fairly constant competitive strategy during the period from the early fifties . Air France , by contrast , had made many major changes in the period and in 1964 withdrew from a number of routes . [1]

The table overleaf shows , in summary form , the progress of developments (in frequency , equipment etc.) in the years up to 1966 .

---

1. Air France eventually stopped all operations in 1969 . BEA then , in liaison with Air France , operated aircraft with were designated a joint Air France / BEA flight .

Details of Innovations in BEA/Pan American/Air France competitive Operations on Internal Services Germany 1950-1966

	British European Airways	Pan American	Air France
Pre 1950	Monopoly routes operated by all three airlines		
	Frequent switching between routes: routes other than Berlin-Major cities are operated by all airlines		
	Viscount aircraft	DC 4 aircraft	
	Development of the Lufthansa, German Airlines, taking up most routes except Berlin routes		
1960	Hamburg/Hanover Dusseldorf/Cologne Frankfurt/Munich	DC6B aircraft Hamburg/Hanover Dusseldorf/Cologne Frankfurt/Munich	Move from Tempelhof to Tegel
	BEA begin to increase frequency relative to Pan Am	Stuttgart/Nuremberg	Caravelle aircraft
		Reaction to BEA frequency increases	Reduction onto two routes. Great increase in Frankfurt and Munich sectors
	Stuttgart and Bremen routes added		
1966	Introduction of Viscount Silver Star services	Introduction of 727 jet aircraft	

The operation of passenger aircraft by airlines of the Allied powers into Berlin has become more complex since the post-war development of the German Airline , Lufthansa . The possibilities of allowing the German Airline to operate into Berlin has been raised regularly - but this decision relies on four-power agreement . Under the political conditions of 1966 it was considered unlike that in the short term (at least 5 years) the national carrier would be allowed into Berlin . But there is some evidence that the possibility of an eventual " write-off " of the routes had some effect on both the competition and the capital and equipment investment in Germany by the airlines . The problem of the rapid obsolescence

of equipment would present great difficulties to both BEA and Pan American if they had to disperse extra fleet from Germany over the remainder of their routes networks . This may be the reason why both Airlines , in 1966 , operated rather antiquated equipment on the Germany routes compared with elsewhere in the world . Additionally the equipment operated by both companies in Germany was rather more suited to the short stage , high frequency type of operations rather the first generation jet aircraft available at the time . From 1962 until April there were three major developments in the competitive environment . These were : -

1. The decision made by Air France to " rationalise " its operations by retrenchment to two routes only . This was a consequence of the introduction of the Caravelle aircraft into the German internal route-network and the use of Tegel airport . The resulting over-capacity on the Berlin to Frankfurt and Munich route had reduced the load factors of all operators on these routes . Air France , only operating these two sectors , was the worst effected airline with load factors reduced from 61% down to 44% in 1964 .

2. British European Airways , since the introduction of a West German (F D R) subsidy , had made a definite effort to increase their share of the total market . During the summer of 1963 BEA had increased the total frequency of services by 60% and by corresponding large percentages in the following and subsequent summer periods . Pan American airlines followed with a similar increase in basic frequency , but this was not enough to prevent BEA's share of the total German market increasing from under a quarter of the total market to exactly one-third in the period 1962 - 1965 .

3. The final environmental characteristic up to the period when the research was carried out was the constancy of the equipment operated by the three competing airlines . This equipment was the Vickers Viscount , The Sud Aviation Caravelle , and the Douglas DC 6B for BEA , Air France and Pan American Airlines , respectively .

APPENDIX 4.2

The Silver Star Innovation used as a Tracer : 1966

The environmental situation of BEA in Germany in the years up to April 1966 has been described in the previous appendix . By the summer of 1965 BEA had taken a larger share of the market each year in the period since 1963 . During 1965 BEA became aware that Pan. American Airways had plans for the re-equipment of both the Caribbean and German Areas with new aircraft. Both these areas had been served for a long time with elderly DC 6B aircraft . The proposed replacement was the Boeing 727 aircraft .

Preliminary discussions between the Area Manager and the Fleet Planning department and the BEA Chief Executive concentrated on the general selection of actions available to BEA to met the challenge for the share of the market which would be posed by P A A after the spring 1966 .

The first strategy considered was that of seeing whether existing BEA aircraft could be introduced into Germany . Because of restictions of airfield performance it was discovered that none of the aircraft types within BEA was able to replace the existing Viscount aircraft . It was possible to switch to another Berlin airport , namely Tegel , and use other aircraft . This was rejected because of the unsuitability of Tegel - being well away from the Berlin destination of most travellers to Berlin . At this time BEA were planning their next cycle of equipment purchasing and the suitability of new jet aircraft for the operating requirements in the Internal Services , Germany was a major question . At this stage the question of new equipment was was particularly relevant . New aircraft could not be obtained for at least a year . The important decision was between the retention of Viscount services into Tempelhof - or the introduction of existing jet aircraft into Tegel airport . The long term intention of attempting to maintain services into Tempelhof led to the decision to continue with Viscount services into Tempelhof airport .

Once this primary decision had been made a market survey was planned with the objective of finding out something of the parameters of appeal in service factors which BEA could incorporate into their services . The result of this survey has a decision , taken in late 1965 , to introduce a product with the name of the " Silver Star " service . The main component of this would be an improved service with no change in the aircraft type operated .

The specification for the Silver Star service was as follows : -

a Improved Seating (less seats in the cabin)

b Improved food (quantity and quality)

c Reduced Check-in times (less waiting time at airports) .

d More " give aways " (free gifts given to passengers)

e More advertising to make the public aware of the new servuce

The concept , as described here , was formalised on January 8th 1966 on the publication of the summer timetable for 1966 which introduced the Silver Star service .

APPENDIX 4.3

Objectives and Hypotheses for test in the Preliminary Organisational Study in B E A Germany

Objectives

1. To identify the task functions in airline operations .
2. To identify control systems associated with these task functions .
3. To identify the organisational structure of B E A in Germany in terms of both the hierarchical levels and the distribution of functions between the members in the organisation , and the allocation of control activities to members .
4. To examine changes which occur in stable management control systems and structure when an innovation is introduced into the analogue of production technology in airline operation .

Within these general objectives the following hypotheses were tested : -

1. That the model of control and decision-making proposed can be used for organisional analysis .
2. Changes in the basic task activity of B E A in Germany resulted in changes being introduced into the basic characteristics of the control systems in Germany .
3. That a model of decision-making activity concerned with the operation of the Silver Star services will be appropriate in the early stages of operation . The suitability of this model will be supplanted by the increasing importance of the control portion of the model .
4. That the organisational structure at the various stations will be dominated by the control systems which exist in all B E A station operations rather than the local characteristics of size of offices , airports , etc.

5. That the kind of control systems found in Internal Services , Germany , and the organisational structure found in association with dynamics of organisation are those that can be readily compared with other parts of B E A's organisation and with the completed and planned simulation studies .

6. That changes in organisation structure , due to changes in the control system , will be unlikely to occur during the duration of the present study . Change in the functions of certain personnel within the time period of this study is proposed .

APPENDIX 4.4

OUTLINE INTERVIEW SCHEDULE USED IN GERMANY STUDY : 1966

1. Information about the Organisational Structure

a Responsible to whom ?

b Who are you responsible for ?

c What is your organisational title ?

What changes have there been since the development of the Silver Star service ?

2. Information about the work activities of people and patterns of interaction

a What does you job involve ?

b Do you have a job specification or a detailed job description ?

c With whom do you come into contact with in your work (Telex/telephone , written , and face-to-face) ?

d From whom do you receive materials (information etc.) which is used by you in your work ?

What changes have there been since the development of the Silver Star service ?

3. Information about Control Systems

a Do you control an " on-going " activity (a task activity) ?

b Do you control levels etc. on organisational items (element activities)

c Do you with other people carrying out the same function ?

d Does anybody control any part of your work - or specify the framework within which you work ?

What changes have there been since the development of the Silver Star service ?

4. Opinions and Sentiments about the earlier response categories

A About organisational structure ?

B About the topic of work ?

C About control systems within which they work ?

D About the influence of change due to Silver Star service on categories A , B , and C ?

APPENDIX 4.5

GENERAL ORGANISATION OF AREA AND STATION MANAGEMENT IN B E A , 1966

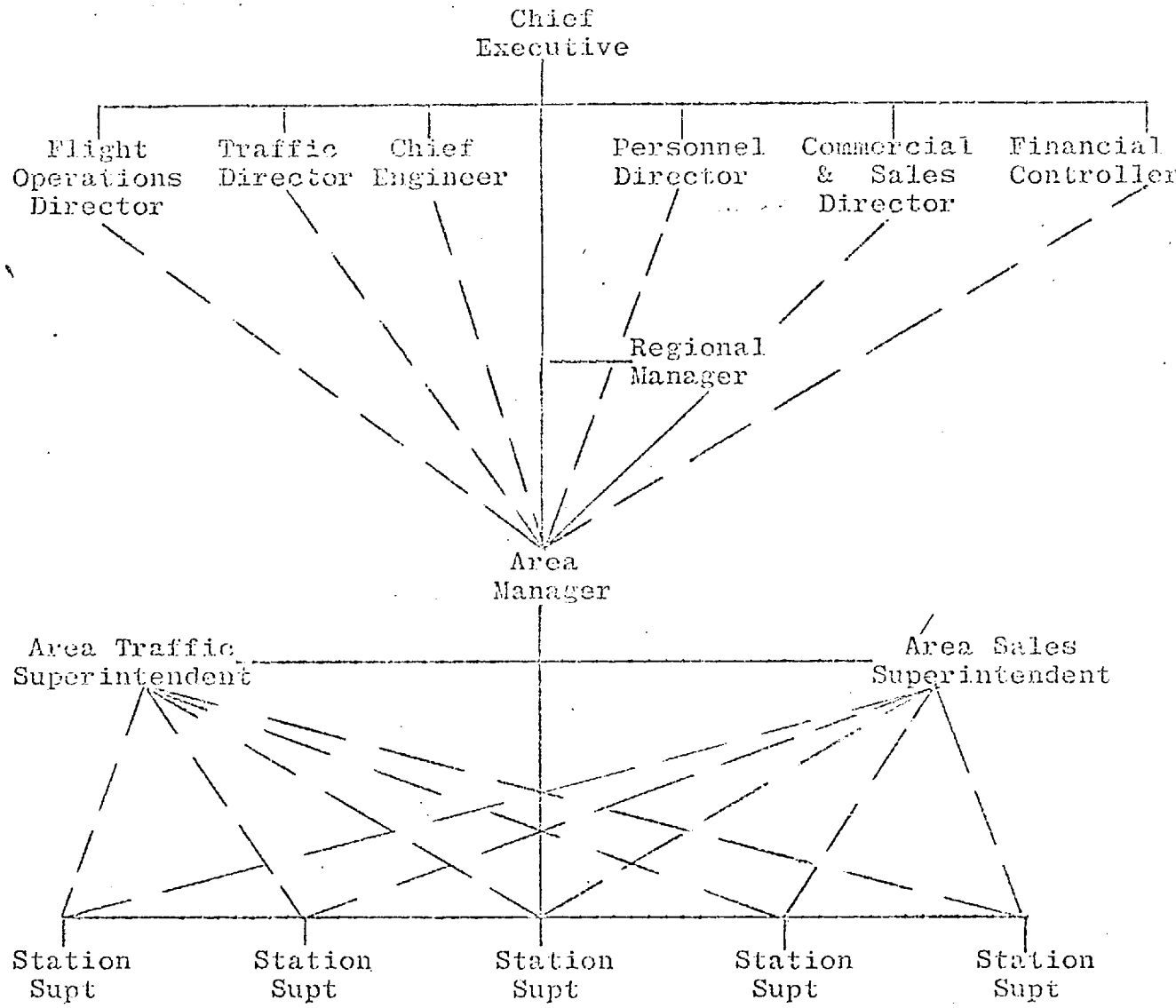
Responsibility for planning and operations of BEA services in particular parts of Europe are delegated to sections of BEA's management located in the specific area . These areas generally correspond with particular countries , for example , Austria , Belgium . Others are concerned with combines of countries , especialy where there are only limited services . Every area is , in some way , unique , due in part to the size and importance of BEA's operations in that area and also due to geographical , historical and political (as in Germany) reasons .

The most senior member of an ' area ' is Manager and the relationship this head of an area has with the 'Head Office' of BEA is shown overleaf . Included is the general relationship between the Area Management and the Station Management . While this scheme gives an indication of the idealised structure very few areas actually correspond to this pattern . German Area and Station organisation , for example , differed from this pattern .

The managers of an area , who have 'administrative and executive control' over an area , report directly to the Chief Executive . Lines of 'functional control' link each Area Manager to the six 'Head Office' departments in London . This means that although an Area Manager is responsible to the Chief Executive for all BEA activities in his area he must take the advice and guidance of , for instance , the Commercial and Sales Department before launching a sales drive . Similarly he is given advice and information about new procedures and practices that have to be adopted throughout the whole BEA network .

Usually each BEA Station is run by a Station Superintendent . His job , like that of the Area Manager , is not confined to traffic work . He will have a Sales and Reservations Officer , an Engineer , as well as a Senior Traffic Officer reporting to him . In larger areas (like Germany) specialist advice (from Traffic , Engineering and Sales Superintendents) is available from the Area Office .

GENERAL MODEL OF THE RELATIONSHIPS BETWEEN 'HEAD OFFICE' AND 'AREA MANAGEMENT' AND BETWEEN 'AREA' AND 'STATION' MANAGEMENT IN B E A .

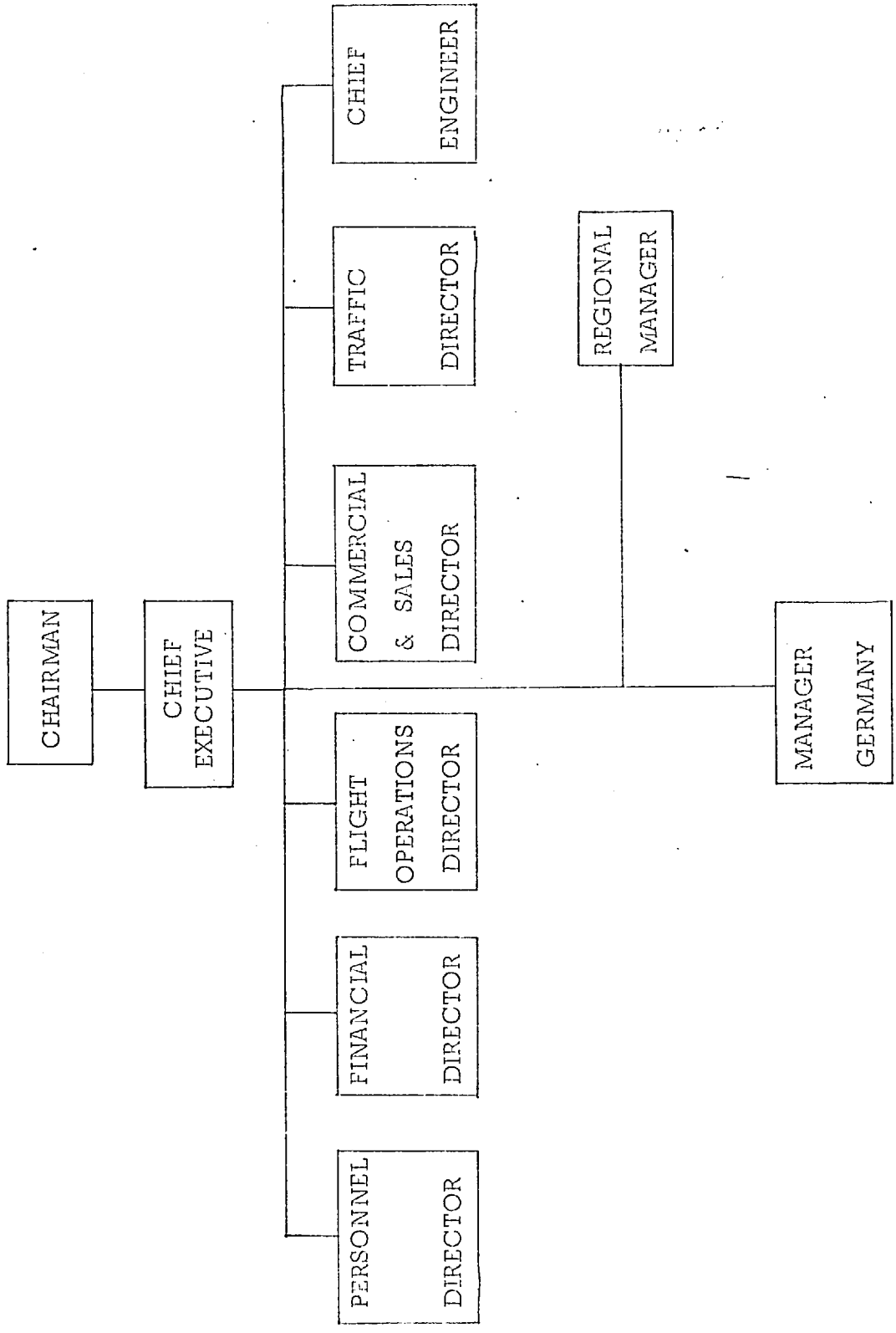


Key _____ administrative and executive control

- - - - - - - functional control

IN THE HYPOTHETICAL AREA REPRESENTED BY THE SCHEMATIC ABOVE A STATION SUPERINTENDENT WOULD REPORT TO HIS AREA MANAGER ON 'GENERAL POLICY' MATTERS - BUT WOULD WORK WITH , FOR INSTANCE , THE AREA TRAFFIC SUPERINTENDENT ON PURELY TRAFFIC MATTERS .

THE RELATIONSHIP BETWEEN THE AREA OF GERMANY [INDICATED BY THE MANAGER , GERMANY] AND THE 'HEAD OFFICE' ORGANISATION OF BRITISH EUROPEAN AIRWAYS , 1966 .

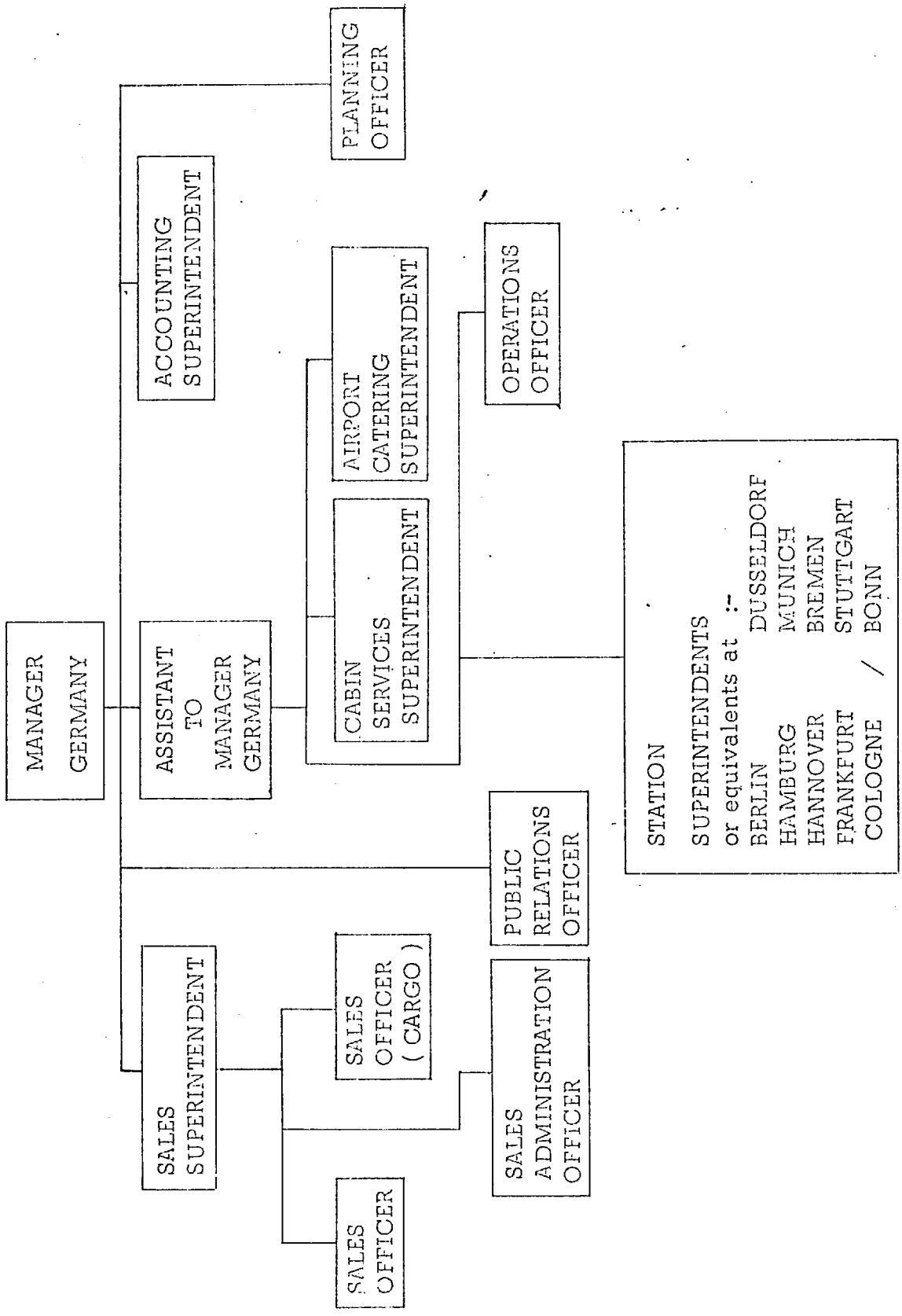


British European Airways Corporation Organisation

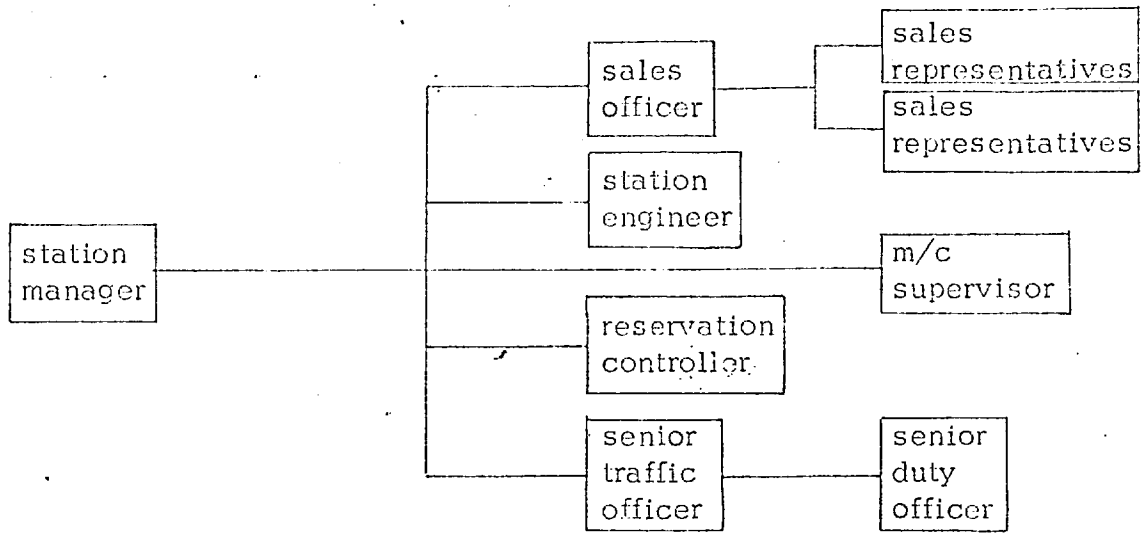
1959 to 1966

'ORGANISATIONAL STRUCTURE' OF THE AREA MANAGEMENT

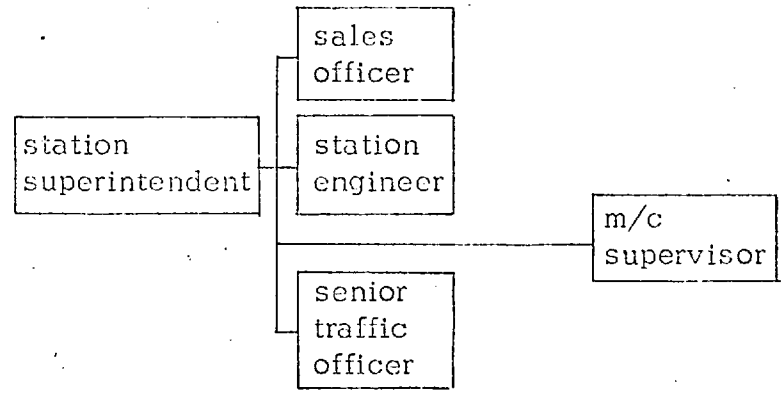
B E A GERMANY , 1966 .



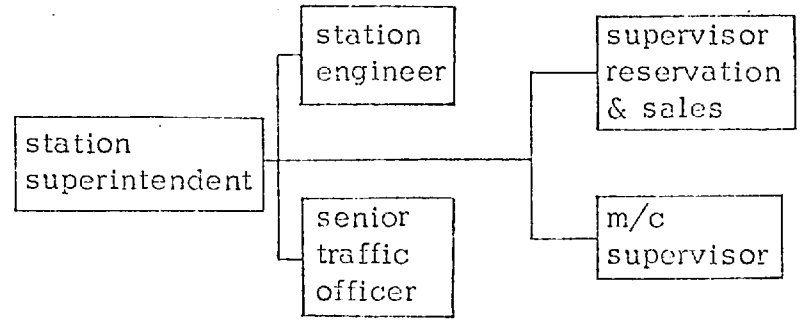
MANAGER SUPERINTENDENT OFFICER SUPERVISOR



BERLIN



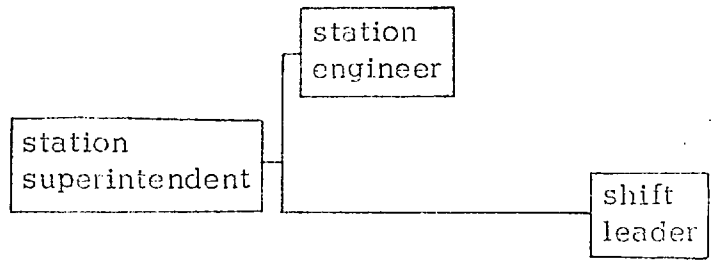
HAMBURG , HANNOVER , FRANKFURT & DUSSELDORF



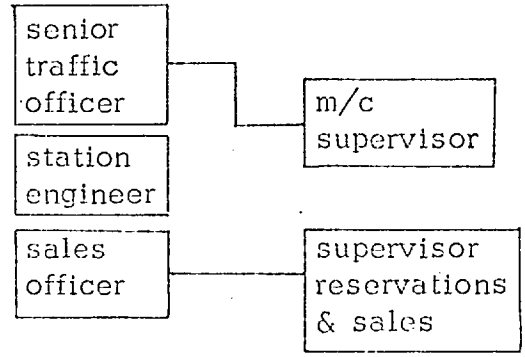
MUNICH

Organisational Structure at British European Airways Stations - Germany, Summer 1966.

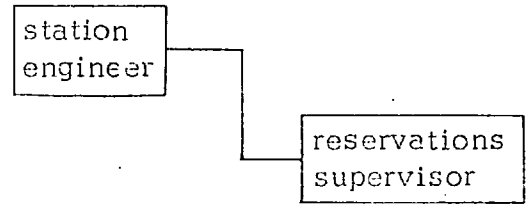
MANAGER SUPERINTENDENT OFFICER SUPERVISOR



BREMEN



WAHN (COLOGNE & BONN)



STUTTGART

Organisational Structure at British European Airways Stations - GERMANY , Summer 1966.

See Appendix 12.8 for an extract of a page from the Organisational Manual of British European Airways .

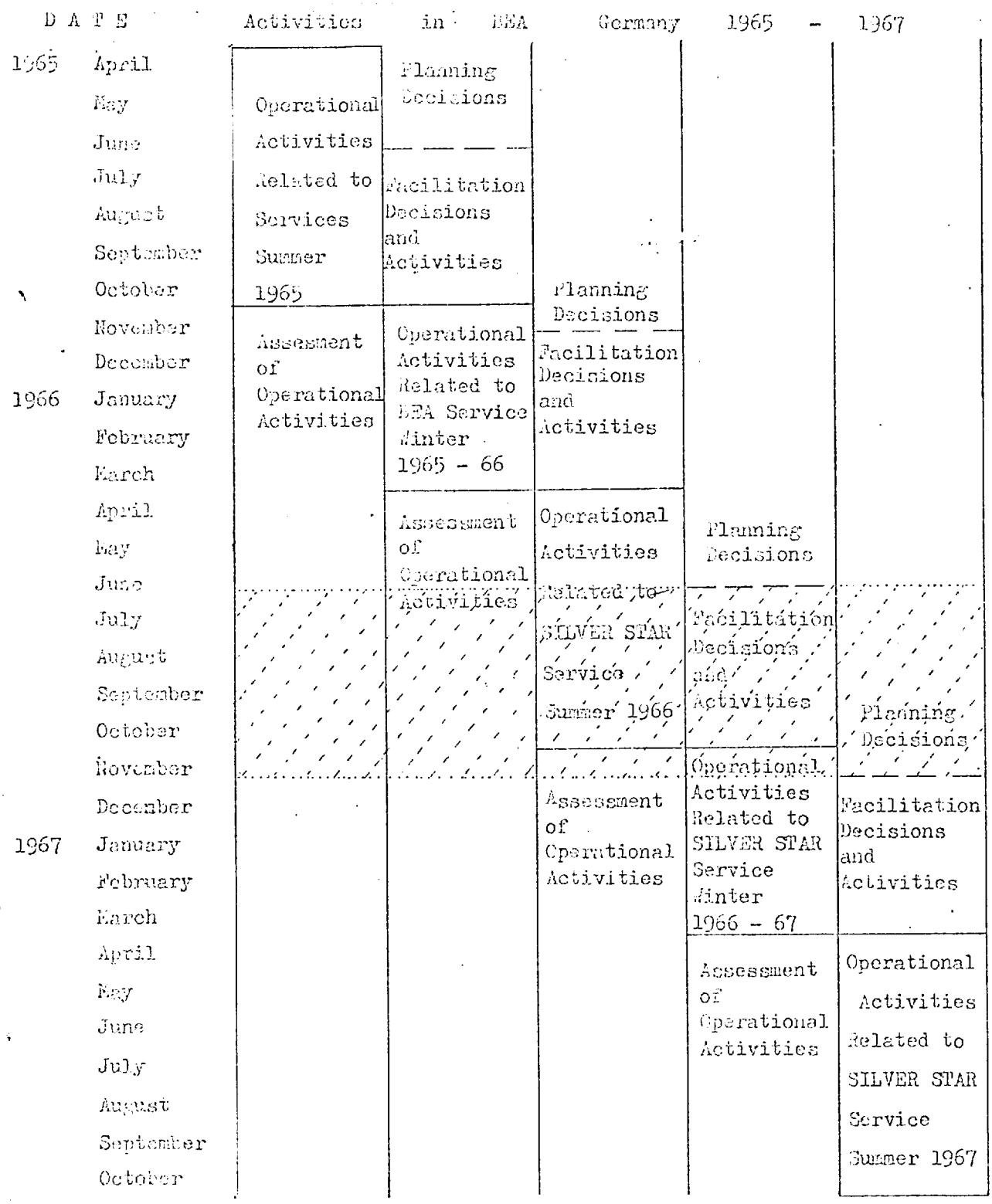
BEA BREMEN - FLUGHAFEN NEUENLAND

STAFF DUTIES

STATION SUPERINTENDENT	-	Station Administration English Correspondence & Filing Float Holder Notice Board Amendments to - Accident Procedure ASP Manual Ground Handling Manual Personnel Dept Instrs
SHIFT LEADERS	-	Cargo Duties/Accounting/Correspondence Amendments to Cargo Manuals Load Sheet Compilation/Despatch of Documents Amendements to Load Control Manuals Lost Baggage/Lost Cargo Maintaining "Staff Info" File
Additional Responsibilities		
Mr H ROTHAUSCHER	-	Senior Shiftleader with overall responsibility for Cargo, Bremen
Miss G ACKERMANN	-	Staff Roster & Time Sheets Stationery Indent
Miss H NEUMANN	-	Lost/Damaged Property Correspondence Deputising for Cashier (Temporary)
Miss C PAPENBERG	-	Reservations Controller/Cashier Ticket Stock Control & Indents Refunds MCO Book
Miss A HOLSTE	-	Cargo Assistance/Cashier Assistance Stamp Float C ontrol Amendments to - Passenger Fares Manual (VIII) BOAC Manuals Credit Stop List Fraud Prev Notices
Miss M BOHLM ANN	-	Reservations Statistics Telephone Call Statistics Production of Local Forms Amendments to - Station Manual (Ticketing, Baggage, Passenger Service, Accounts)
Miss H GONSCHOREK) Mrs R DIDSZUHN)	-	Reservations Correspondence Reservations Systems Other Carriers Timetables Amendments to - Reservations Instrs Reservations Man I Reservations Sales Manual Working Timetables Communications Manual

ORGANISATIONAL STUDY IN B E A GERMANY

COMPARED WITH THE ACTIVITIES RELATED TO DIFFERENT 'TIMETABLES'



— — — Dates of the Internal Services Germany Conferences

Period of Activity observation and Interview Programme

DESCRIPTION OF THE MAIN CONTENTS OF THE MAIN DECISION-MAKING AND CONTROL ACTIVITY RELATED TO THE 'TRACER' IN B E A , GERMANY.

APPENDIX 4.11

Decision Activity Category	Specific Content	Participants in Activity
Clarify Problem	Finding future action of competitors	All Staff BEA Germany. Members of competitive organisations . Some Head Office Staff .
Select Goal	Maintain share of total German market	Area Manager and certain Head Office Staff .
Set Standards	Obtain a certain percentage share of total market on the various routes	Area Manager
Identify Action	Use of various types of aircraft . Use of various types of service . Use of certain fares Use of advertising	All Staff BEA Germany . Certain Head Office Staff .
Identify Outcome	Use of market survey to decide possible load factors .	Sales Section Germany . External market research organisation . Commercial and Sales Branch Head Office .
Evaluate Outcome	Calculate the expected revenue and profit and loss from the Outcomes	Manager Germany and certain Head Office Staff .
Choose Action	Decide the operational strategy on the basis of maximisation of profit	Manager Germany. Chief Executive Head Office .

Decision - Making Activity	Individuals/Departments Involved	Individuals/Departments Prescribing
Clarify Problem	Manager Germany Head Offices Area Office	
Selecting Goal	Manager Germany Chief Executive Area Office Head Offices	Finance Dept.
Setting Standard	Manager Germany Planning Officer Head Office Chief Executive	Finance Dept. Commercial Planning
Identifying Action	Manager Germany Fleet Planning Sales Superintendent All I S G Staff	Fleet Planning Commercial Planning
Identifying Outcome	Commercial Requirements Fleet Plannings Manager Germany All I S G Staff	
Evaluating Outcome	Manager Germany Fleet Planning Station Superintendents Commercial Requirements	
Choose Action	Manager Germany Chief Executive Fleet Planning Manager	

DEPARTMENTS AND INDIVIDUALS IN BEA INVOLVED IN THE VARIOUS DECISION MAKING AND CONTROL ACTIVITIES RELATED TO THE SILVER STAR INNOVATION : A DISTINCTION IS MADE BETWEEN INVOLVEMENT AND PRESCRIPTION .

TYPES OF FEEDBACK INFORMATION

	1	2	3	4	5
Organisation obtaining data	BEA Reservations Units at the Respective Station	BEA Traffic Organisation at each Station	Civil Aeronautics Board based at Berlin	BEA Sales and Commercial Department London	Pan American Area Traffic Office Frankfurt
Operational source of data	State of Advance Booking	Acceptance figures of Passengers	Data supplied to control for flight clearance	Ticket "stubs" clearance for data processing	Acceptance figures of Passengers
Range of feedback Information	BEA Route Flight	BEA Route Flight AF/PAA Route Flight	BEA/AF/PAA Route Flight	BEA Route Flight	PAA Route Flight
Degree of detail included in the feedback information	Load figure likely	BEA Exact Load AF/PAA Imprecise estimate of Load	Number of Passengers on each flight	Load figures BEA for weekly operating periods	Number of passengers on each PAA Flight
Time that data is available to the Area Office	Six months to one day before actual Operations	Monday following a complete weeks Operations	Unpredictable Intervals	Seven to Ten days after a complete weeks Operations	Various
Standard in use	Figures for the summer / winter period	Previous weeks operating figures	Last year's figures	Last year's figures	BEA's equivalent figures

EXAMPLE OF BEA COURSE TIMETABLE

	1000 to 1040	1105 to 1230	1500 to 1545	1615 to 1730	2000 to 2130
Monday 26 Sept	BTA Exercise Briefing	BTA Planning Preparation	Planning for Trial Decision	Planning for Trial Decision	Trial BTA Decision
Tuesday 27 Sept	Course Lecture	Planning for Decision 1	BTA DECISION 1	Course Lecture	BTA DECISION 2
Wednesday 28 Sept	Course Lecture	BTA EXERCISE DECISION 3		Course Lecture	BTA DECISION 4
Thursday 29 Sept	Course Lecture	BTA EXERCISE DECISION 5		Course Lecture	
Friday 30 Sept	Course Lecture	BTA EXERCISE DECISION 6		Course Lecture	
Monday 3 Oct	Course Lecture	BTA EXERCISE DECISION 7		Course Lecture	
Tuesday 4 Oct	Course Lecture	BTA EXERCISE DECISION 8		Course Lecture	BTA DECISION 9
Wednesday 5 Oct	Course Lecture	BTA EXERCISE DECISION 10		Course Lecture	BTA DECISION 11
Thursday 6 Oct	Course Lecture	BTA EXERCISE DECISION 12		Course Lecture	
Friday 7 Oct	Course Lecture	Course Lecture	Course Lecture		

Junior and Middle Management Grades Rates of Pay

Management Scale	Effective from 1 February 1966	Effective from 1 January 1968
M 1	1161	1260
	1196	1296
	1231	1333
	1266	1369
	1301	1406
M 2	1261	1369
	1301	1411
	1341	1452
	1381	1494
	1421	1536
	1461	1577
M 3	1371	1494
	1411	1536
	1451	1577
	1491	1619
	1531	1660
	1571	1702
	1611	1744
M 4	1542	1677
	1597	1724
	1637	1776
	1687	1828
	1737	1880
	1787	1932
	1837	1984
M 5	1717	1868
	1777	1932
	1837	1994
	1897	2057
	1957	2119
	2017	2181
	2077	2244
	2137	2306
M 6	1932	2103
	1992	2166
	2052	2228
	2112	2291
	2172	2353
	2232	2415
	2292	2478
	2352	2540

The figures in the tables give the starting basic pay within each salary grade . Certain additional allowances may be applicable in some cases . Movement between grades in a distinct scale may be controled by a " Proficiency Bar " .

APPENDIX 5.3

LIST OF OBJECTIVES AND HYPOTHESES TO BE TESTED IN THE FIRST STUDY INVOLVING GROUPS TAKING PART IN A COMPLEX MANAGEMENT EXERCISE .

1. To apply and test the validity of using the model of decision-making and control to classify the activities of a group playing a business exercise .

   a. To investigate the hypothesis that certain categories will be more dependent on the nature of the task imposed by the game than others .

   b. To test the hypothesis that the frequencies of certain types of categories will depend on factors other than the nature of the task .

   c. That the frequencies of particular activity categories will change in individual groups as the game procedes .

   d. That certain patterns of activity frequency can be associated with success or failure in the economic factors in the exercise results .

   e. That the concept of a group primarily engaged with decision-making will become inappropriate as the game progresses . Control activity will become increasing frequent , in contrast .

   f. That group members carrying out specific sub-tasks will have similar patterns of activity .

2. To describe the structure of the teams taking part in the BTA Business exercise .

   a. To test the hypothesis that the structure adopted by groups appears to be dependent on the nature of the tasks implicit in the exercise .

   b. That groups with certain structure are associated with greater financial success in the exercise than other groups with distinctly different structure .

   c. That the determination of structure of a group is through the acceptance of control systems which are most relevant and specialy approproate for these particular tasks .

3. To evaluate the usefulness and possibility of developing a controlled experiment using the groups taking part in Management Exercise courses as a source population .

   a. Test the hypothesis that the syndicates adopt the same kind of structure as real organisational groups rather characteristics which could best be described under the head of " group phenomena " .

APPENDIX 5.4

OBSERVATION RECORDING FORM USED IN STUDIES WITH BTA BUSINESS EXERCISE .

0123456789	CP	SG	IA	EO	CA	RA	1	2	3	4	5	6	7	8	9
0123456789	S	D	S		NF		1	2	3	4	5	6			
0123456789	CP	SG	IA	EO	CA	RA	1	2	3	4	5	6	7	8	9
0123456789	S	D	S		NF		1	2	3	4	5	6			
0123456789	CP	SG	IA	EO	CA	RA	1	2	3	4	5	6	7	8	9
0123456789	S	D	S		NF		1	2	3	4	5	6			
0123456789	CP	SG	IA	EO	CA	RA	1	2	3	4	5	6	7	8	9
0123456789	S	D	S		NF		1	2	3	4	5	6			
0123456789	CP	SG	IA	EO	CA	RA	1	2	3	4	5	6	7	8	9
0123456789	S	D	S		NF		1	2	3	4	5	6			
0123456789	CP	SG	IA	EO	CA	RA	1	2	3	4	5	6	7	8	9
0123456789	S	D	S		NF		1	2	3	4	5	6			
0123456789	CP	SG	IA	EO	CA	RA	1	2	3	4	5	6	7	8	9
0123456789	S	D	S		NF		1	2	3	4	5	6			
0123456789	CP	SG	IA	EO	CA	RA	1	2	3	4	5	6	7	8	9
0123456789	S	D	S		NF		1	2	3	4	5	6			
0123456789	CP	SG	IA	EO	CA	RA	1	2	3	4	5	6	7	8	9
0123456789	S	D	S		NF		1	2	3	4	5	6			

APPENDIX 5.5

GUIDE TO THE CODES USED ON THE OBSERVATION RECORDING FORM [APPENDIX 5.4] .

0123456789 CP SG IA IO EO CA RA 1 2 3 4 5 6 7 8 9
0123456789 S D S NF 1 2 3 4 5 6

Each member of the group was alloted a particular number and the code number of the person who was being observed was ringed in position (a) on the form . If this person was communicating with others - then the respective code numbers for these additional people were also ringed (using position b) . The number 0 was used to indicate the involvement of everyone in the group .

In the second section (c) , the purpose of the particular episode , in terms of the categories in the model of decision -making and control , was similarly identified .

The final part of the form , containing sections (d) and (e) , was concerned with identifying the task topic of the episode . The numbers in (d) correspond to the pages contained in the print-out obtained from the computer after each decision . Numbers in (e) refer in a similar manner to the pages in the decision forms which require completion at the end of each group period . Space is provided in these two entries for more detailed specification of the type of data which is being used in the episode recorded .

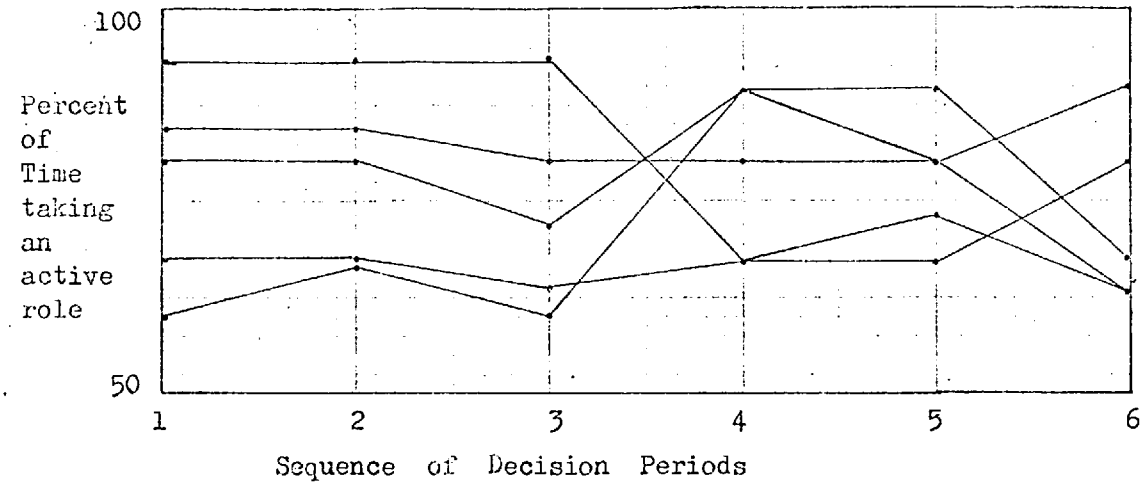
EXAMPLE

0123456789 CP SG IA IO EO CA RA 1 2 3 4 5 6 7 8 (9 17)
0123456789 S ~~0~~ ~~8~~ NF 1 2 3 4 5 6

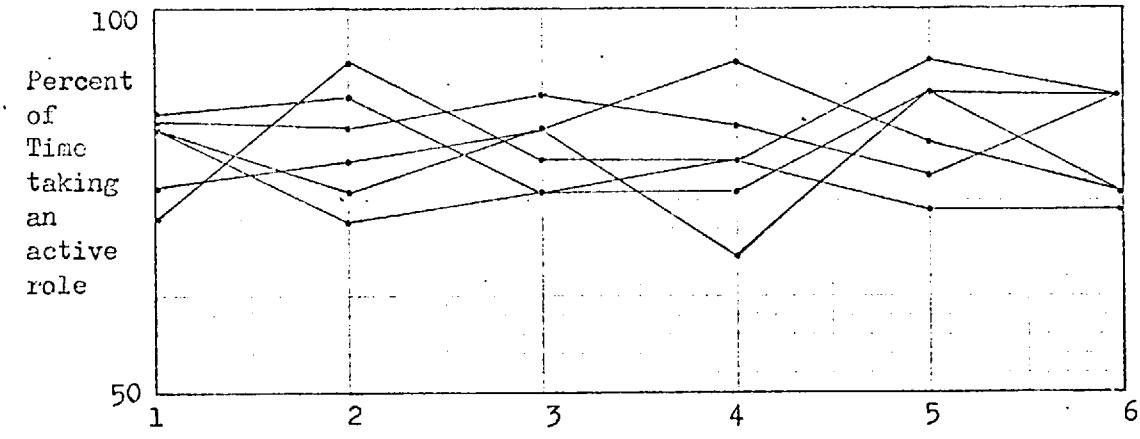
In this example , group member - designated 3 - is working by himself . He is sensing and discriminating information which has been classified as item 17 on page 9 of the print-out .

APPENDIX 5.6

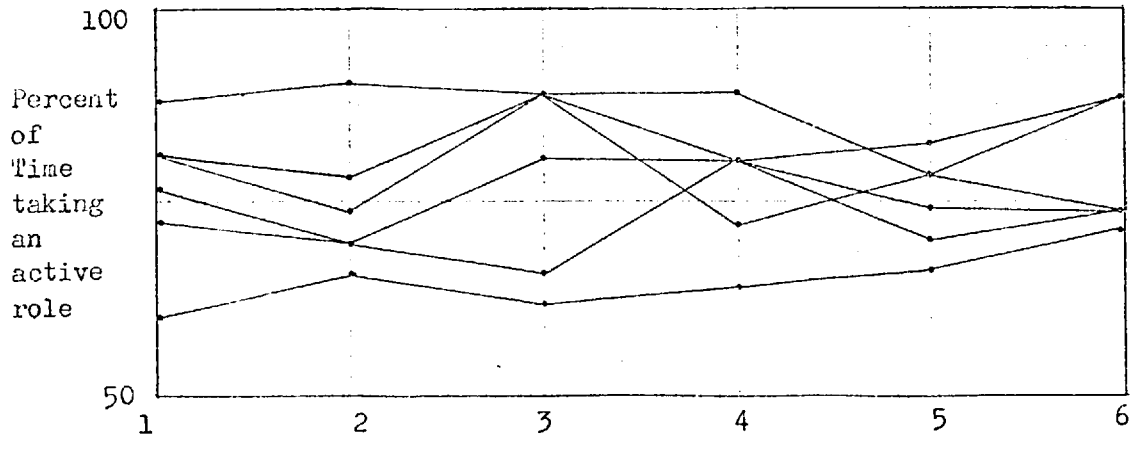
ANALYSIS OF THE PERCENTAGE OF TOTAL TIME IN WHICH MEMBERS OF TEAMS IN B M S 13 TOOK PART IN INTERACTION .



BMS 13 Syndicate 1



BMS 13 Syndicate 2



BMS 13 Syndicate 3

APPENDIX 5.7

THE FOLLOWING GRAPHS INDICATE THE RELATIVE FREQUENCY OF THE DECISION MAKING AND CONTROL CATEGORIES OF ACTIVITY DURING THE USE OF THE BUSINESS EXERCISE B T A FOR B M S COURSES 13 , 14 , AND 15.

RESULTS ARE GIVEN ONLY FOR DECISION PERIODS 1 TO 11 .

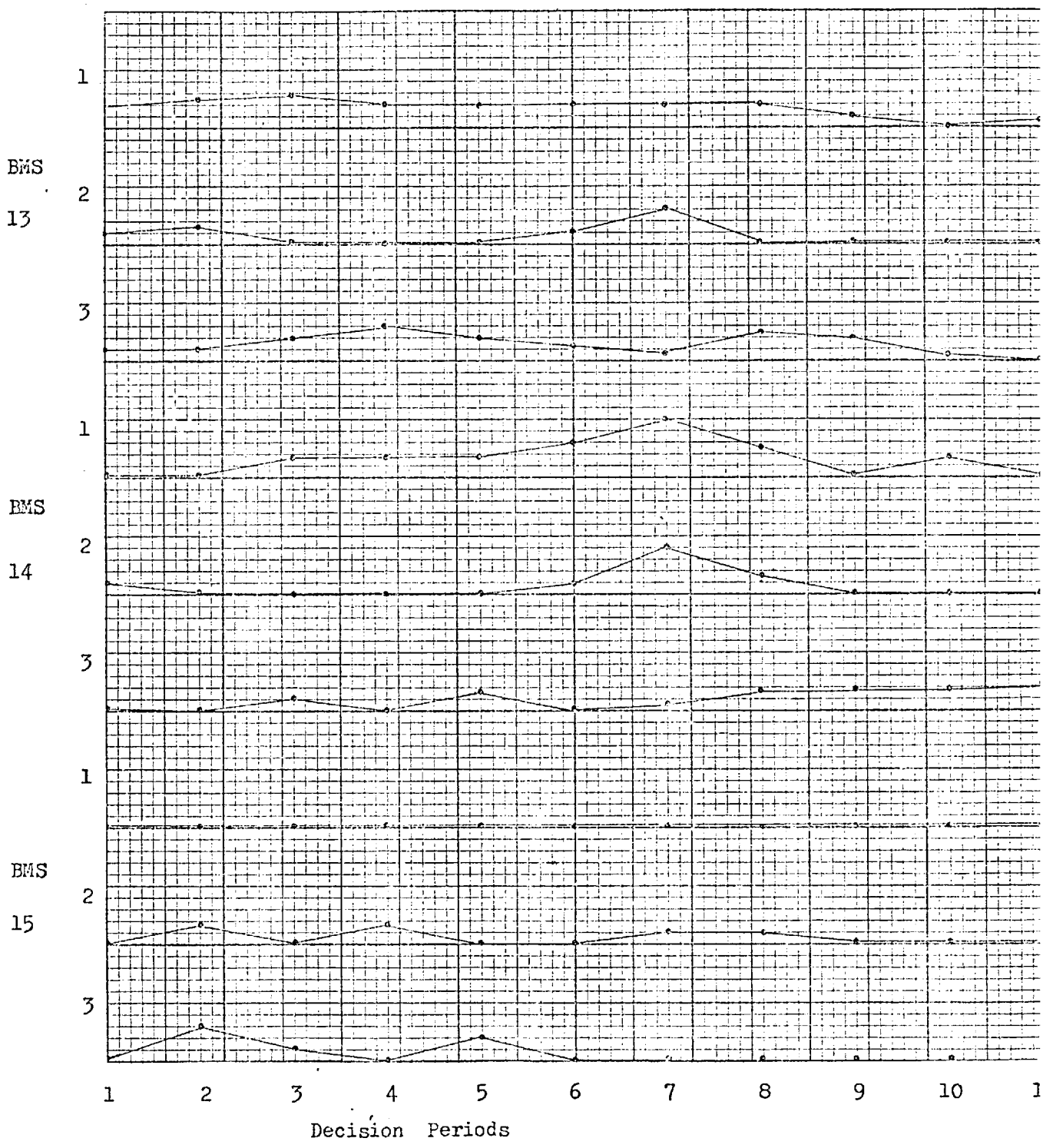
SCALES ARE DIFFERENT IN EACH OF THE SERIES OF GRAPHS REPRESENTING A SINGLE CATEGORY FREQUENCY IN ORDER TO FACILITATE INTER COMPARISON BETWEEN THE RESULTS FOR THE DIFFERENT GROUPS .

THE FOLLOWING IS THE SCALE WHICH IS USED IN EACH OF THE GRAPHS :

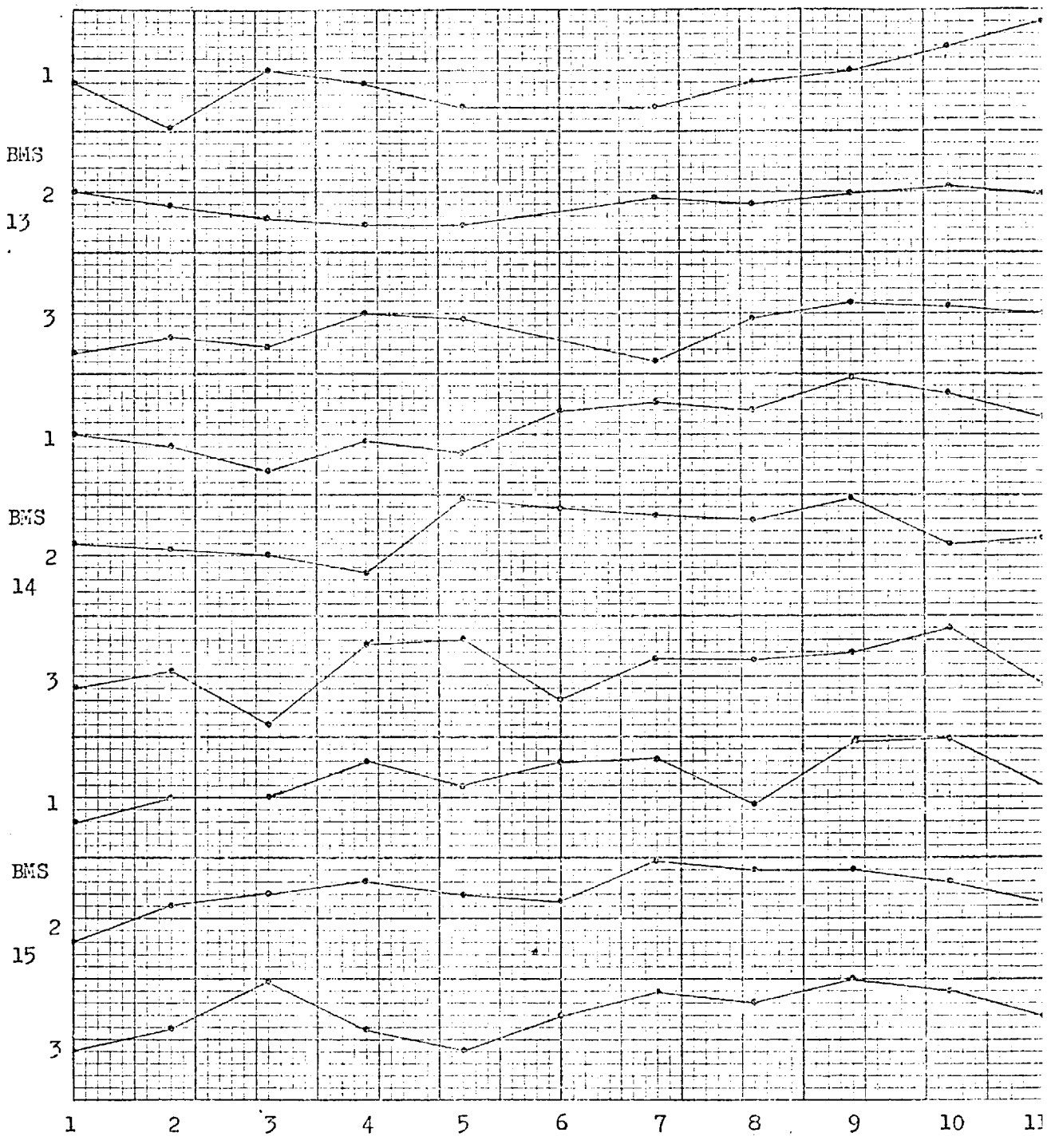
SETTING GOALS	50
IDENTIFYING ACTION	50
EVALUATING OUTCOME	100
CHOOSING ACTION	100
EFFECTING ACTION	40
DISCRIMINATING	100
SETTING STANDARDS	50

THE ABOVE PERCENTAGES ARE REPRESENTED BY 10 GRADUATIONS ON THE FREQUENCY GRAPHS .

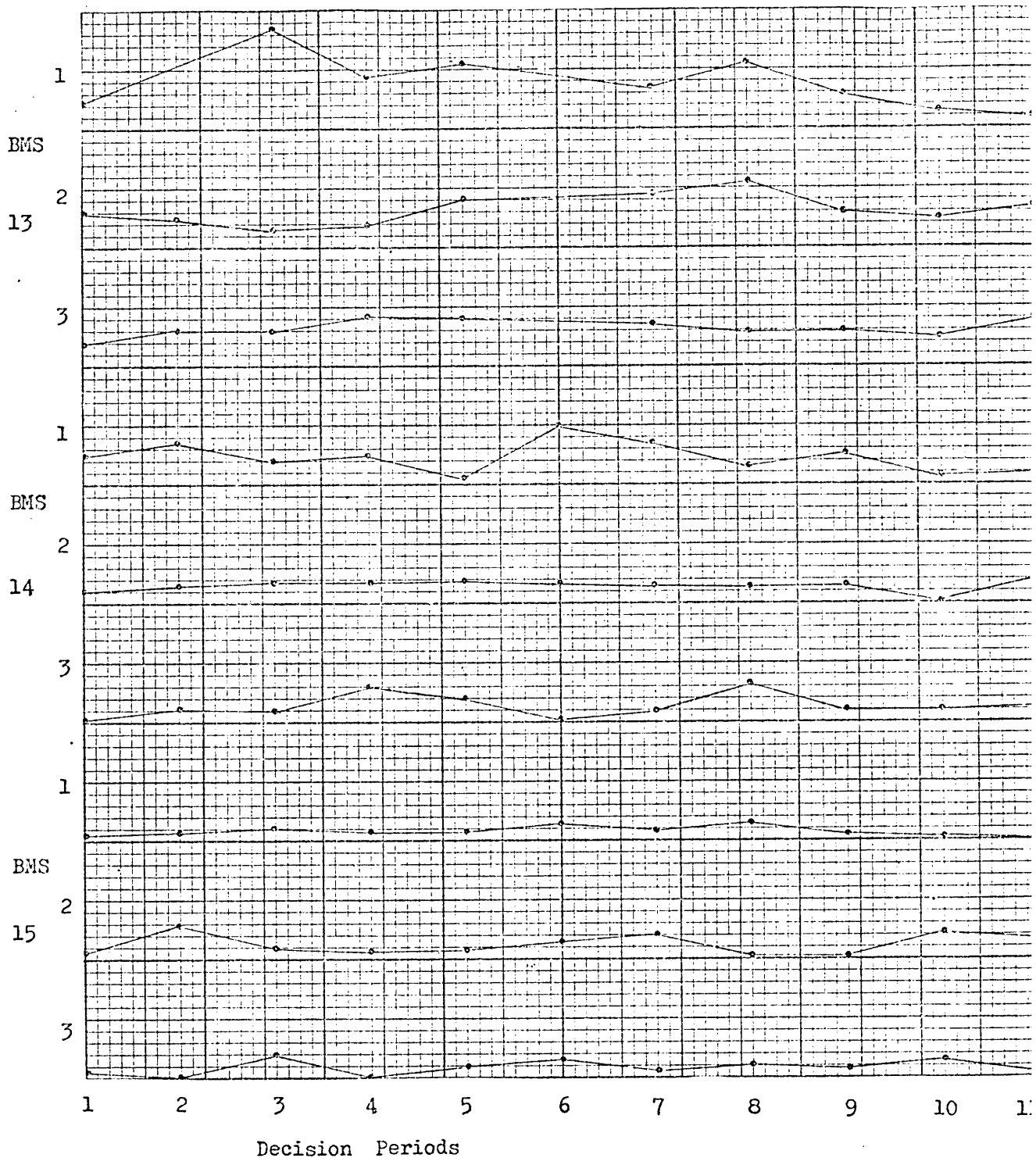
Activity : SETTING GOALS



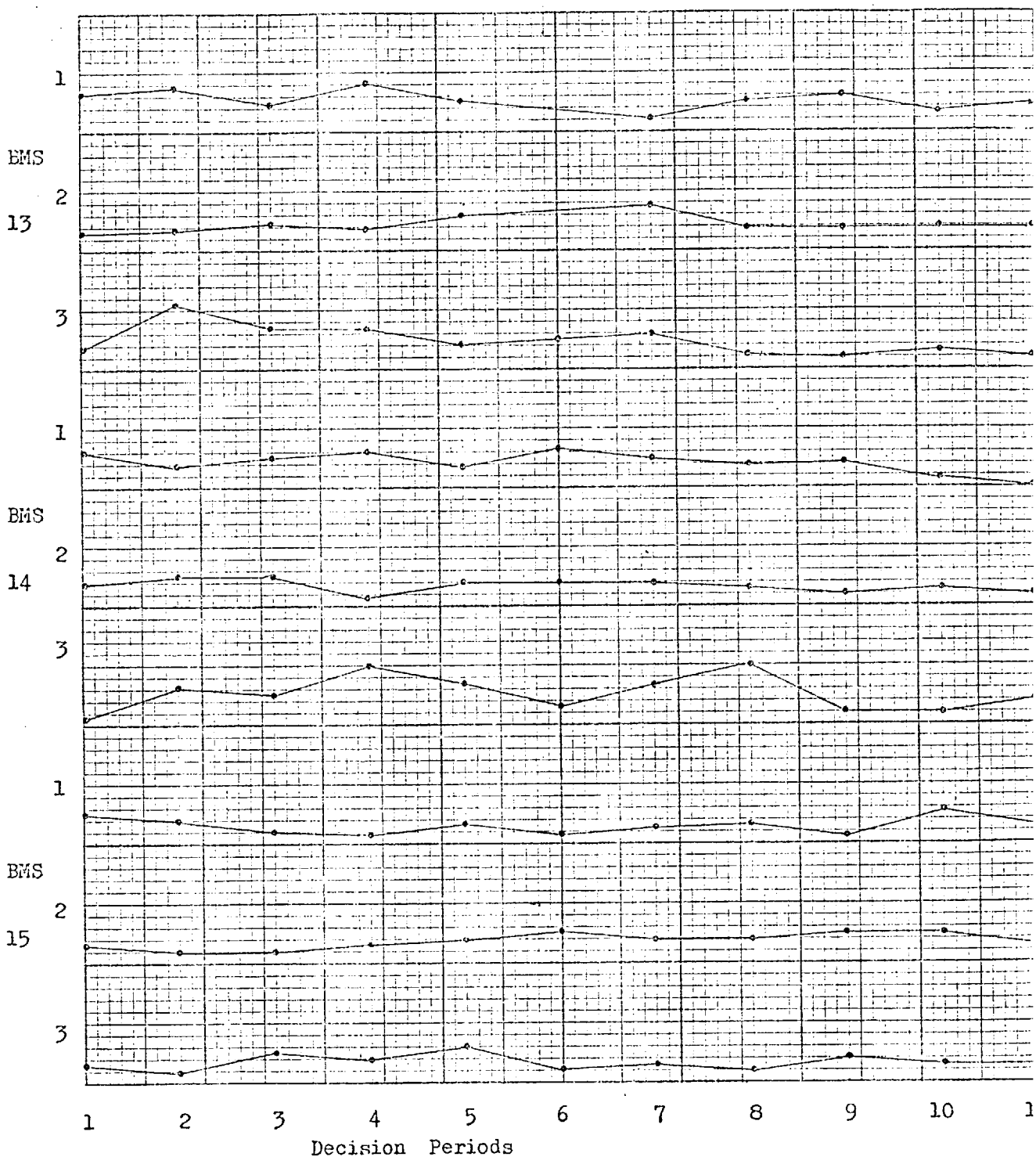
Activity : IDENTIFYING ACTIONS



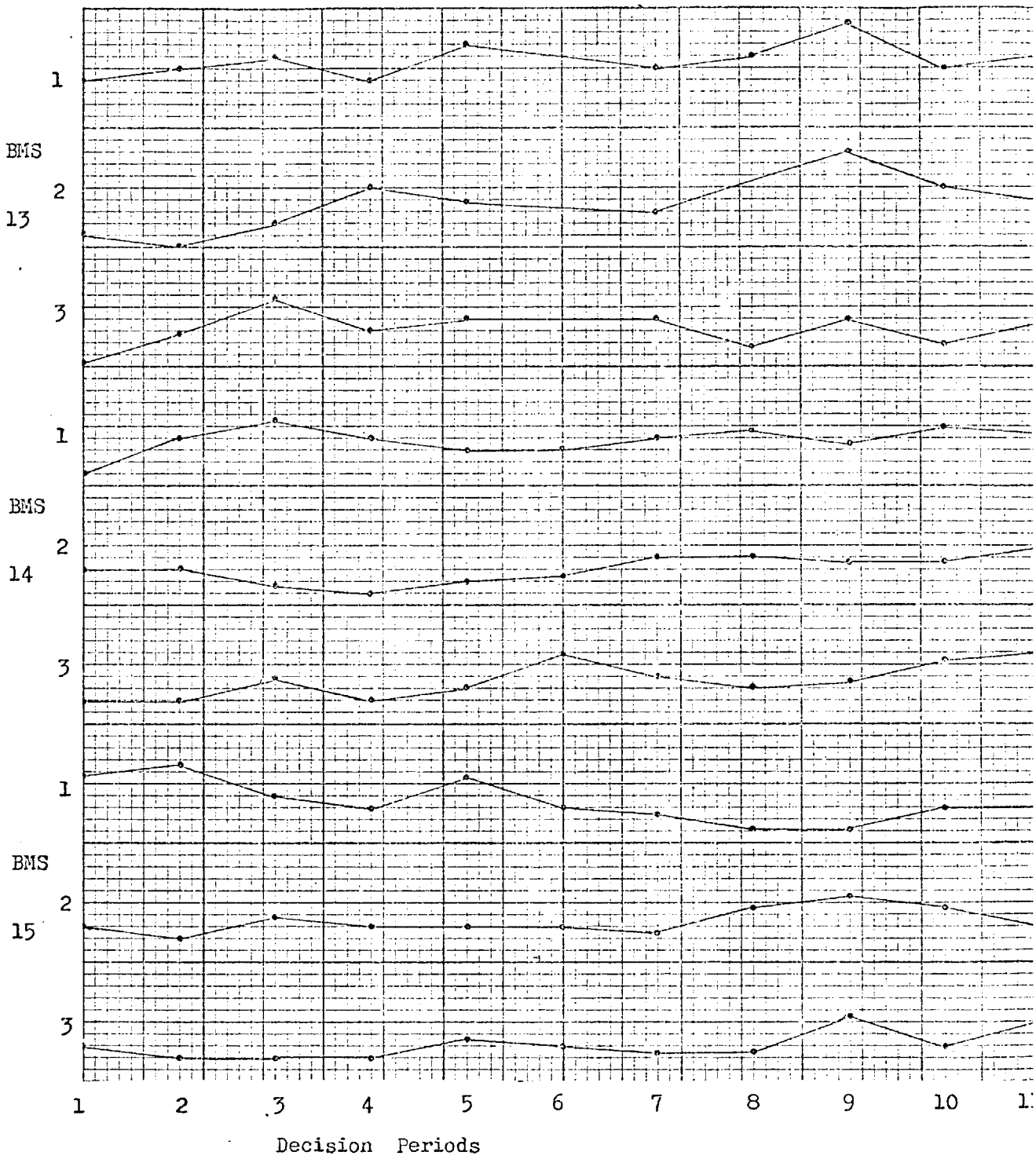
Activity : EVALUATING OUTCOME



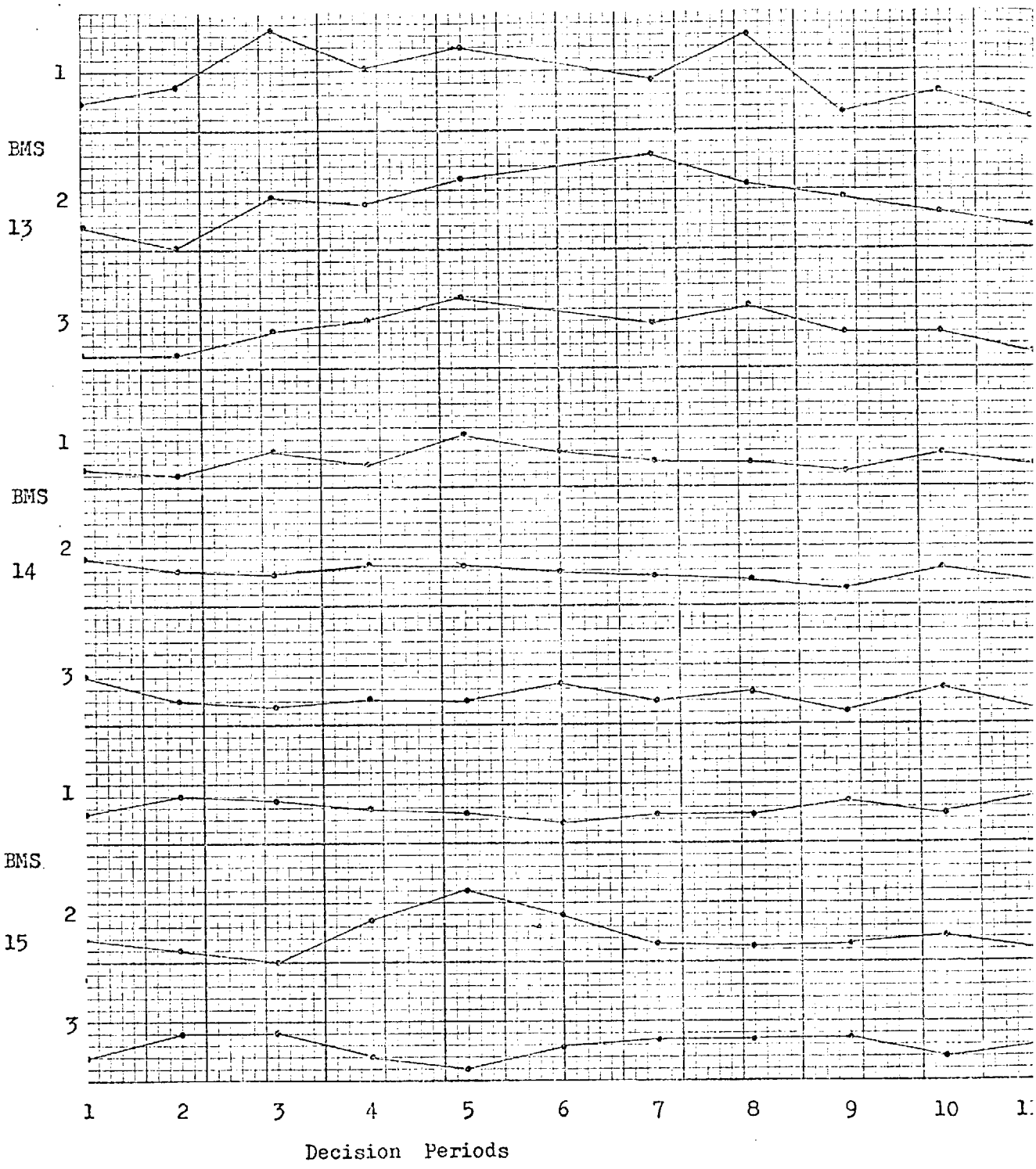
Activity : CHOOSING ACTION



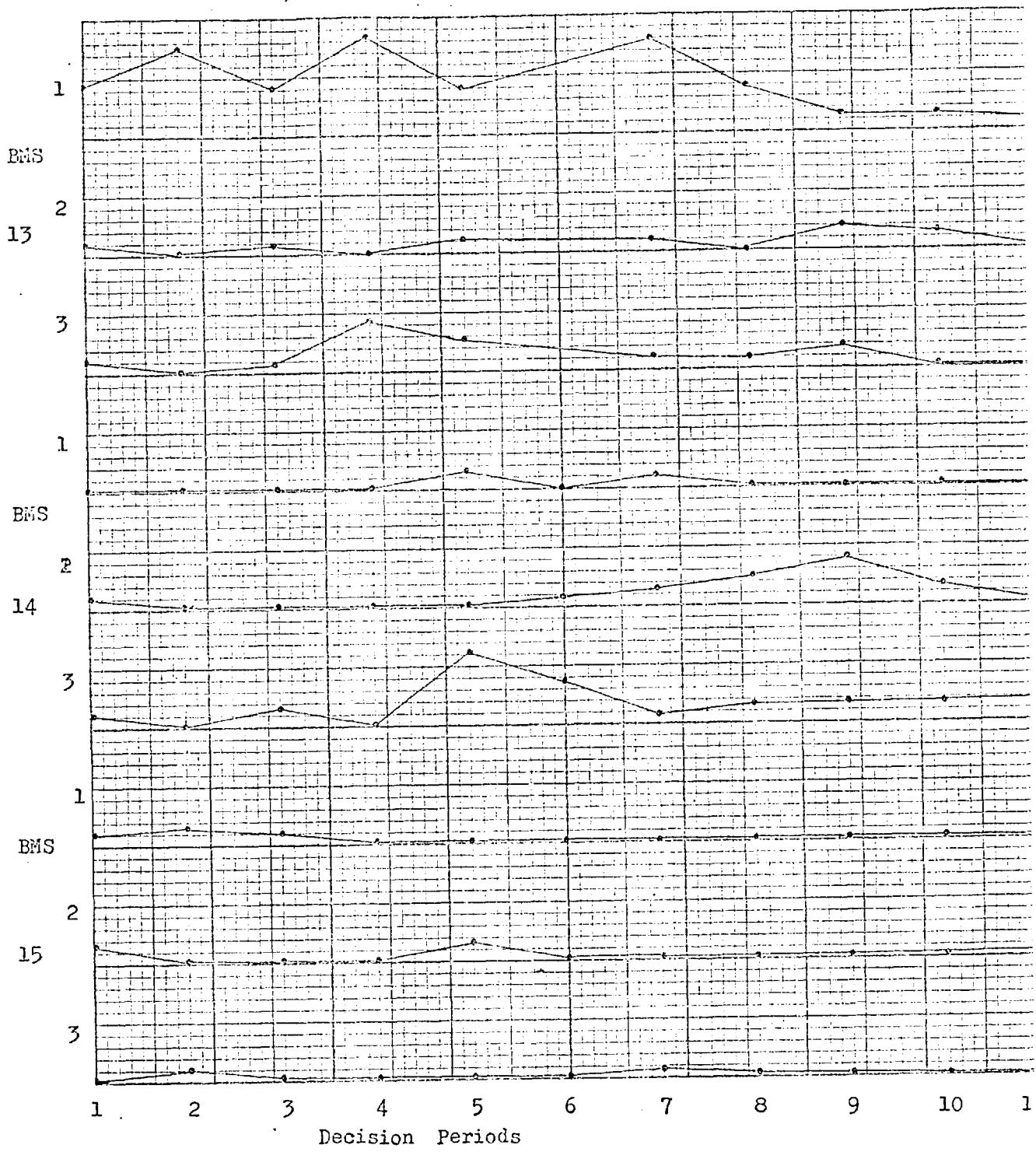
Activity : EFFECTING ACTION



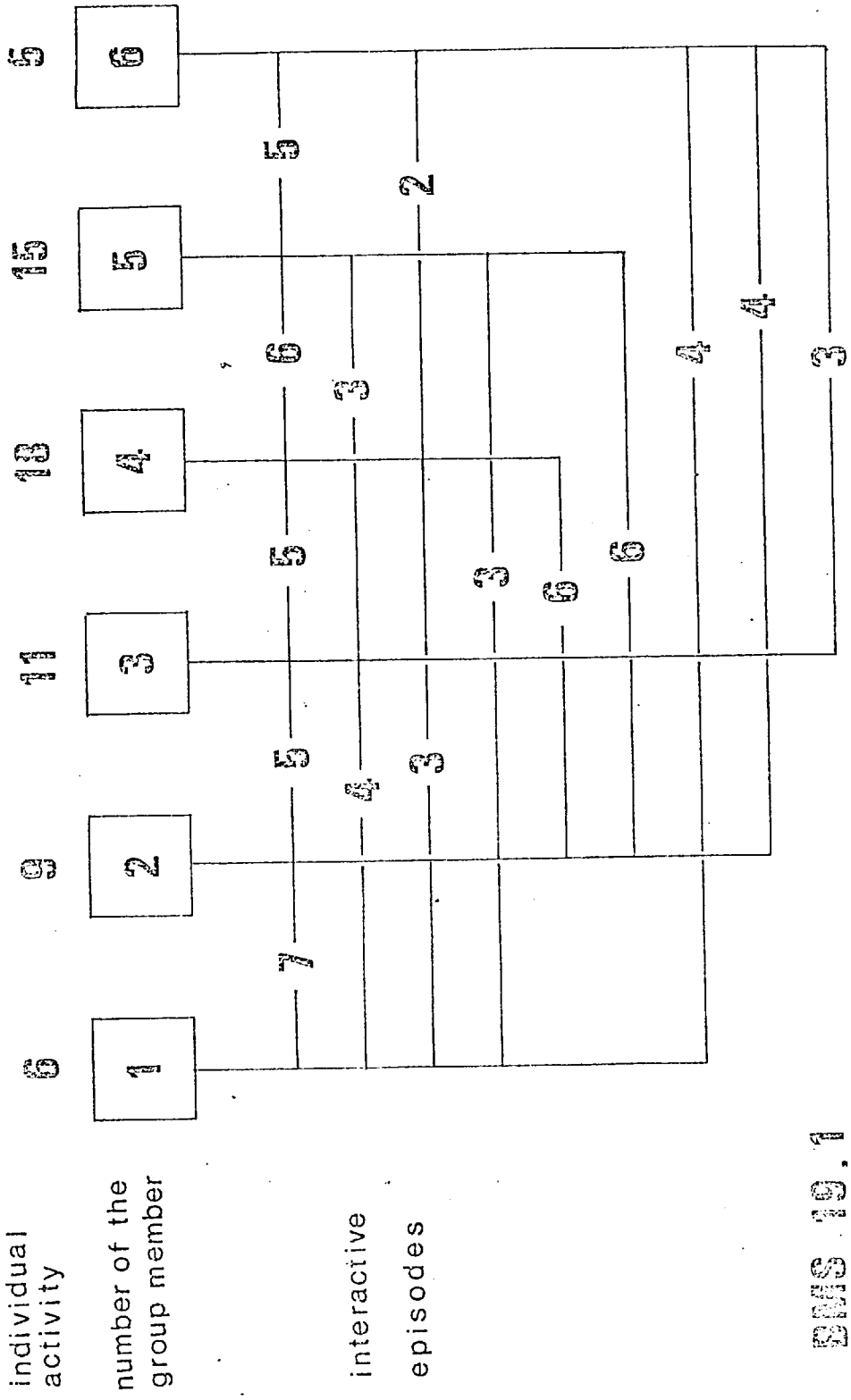
Activity : DISCRIMINATING

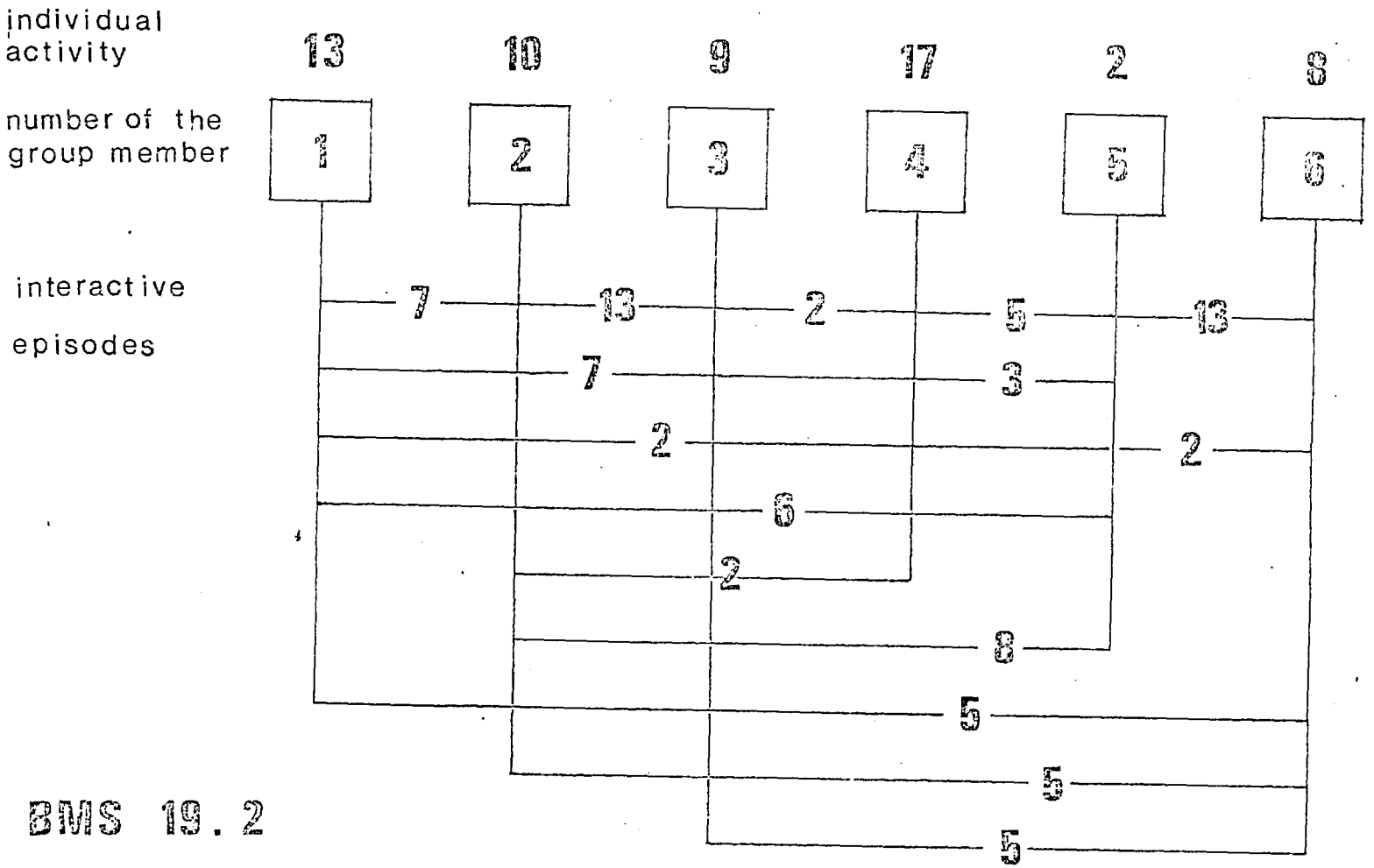


Activity : SETTING STANDARDS

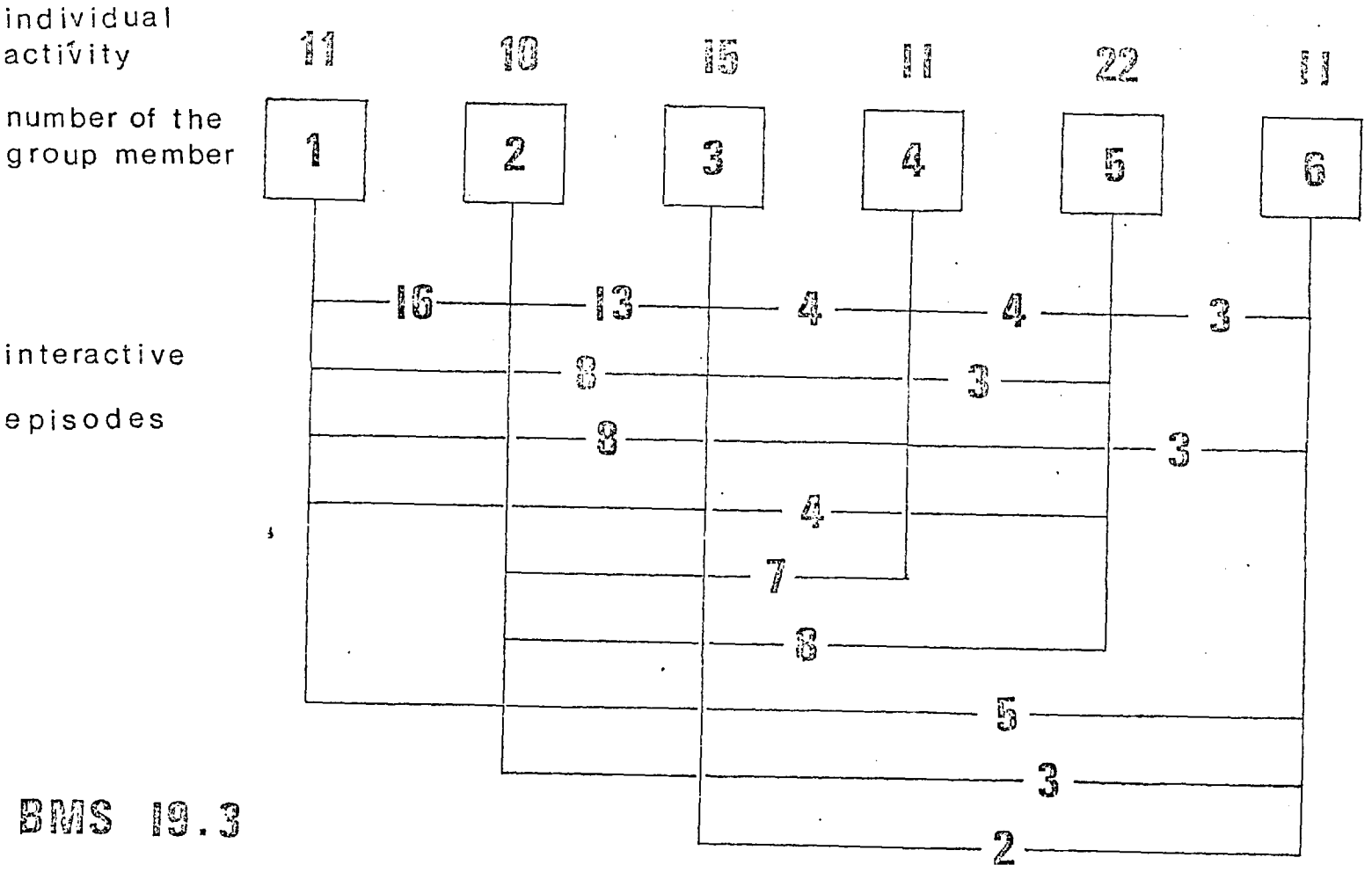


DISPLAY OF INDIVIDUAL AND PATTERN OF INTERACTIVE ACTIVITY FOR THE THREE GROUPS OF B M S COURSE 19 .



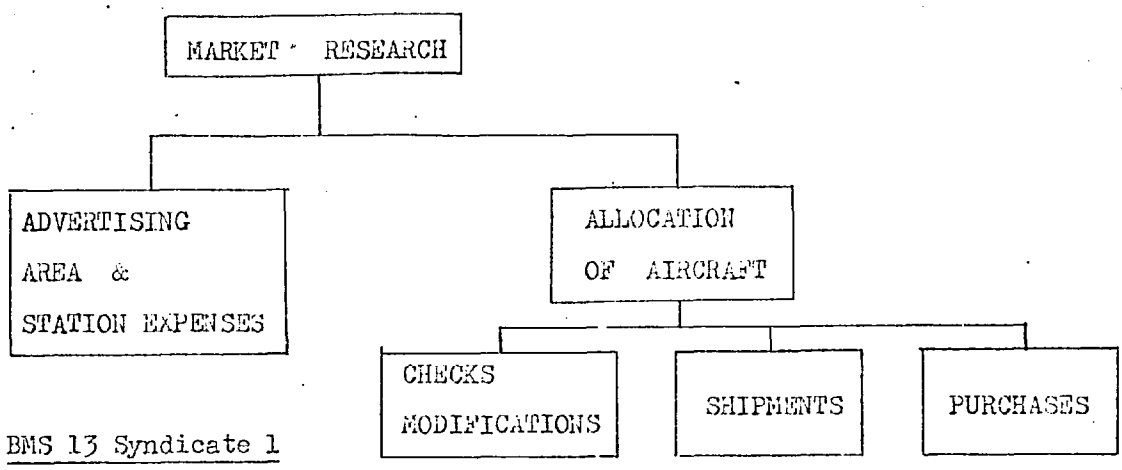

individual activity
13
10
9
17
2
6
number of the group member
1
2
3
4
5
6
interactive episodes
7
13
2
5
13
7
5
2
2
6
2
8
5
5
5

BMS 19.2

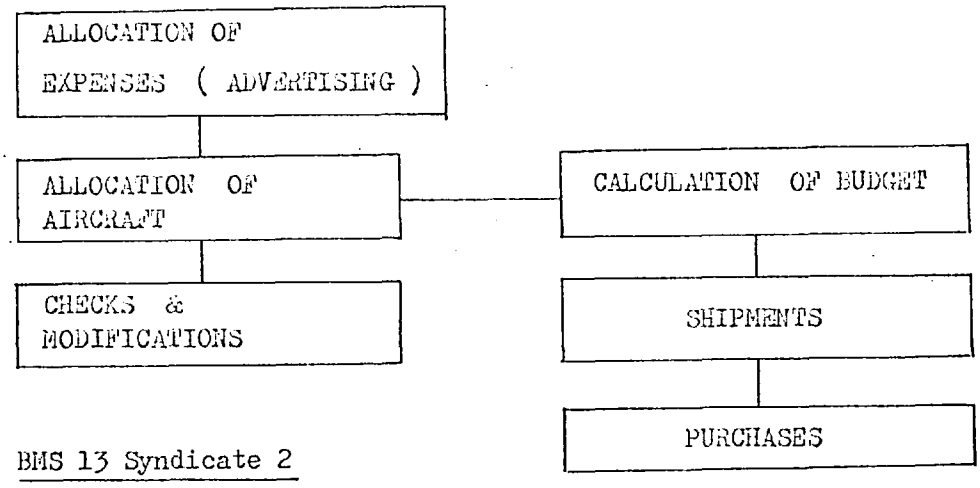

individual activity
11
10
35
11
22
11
number of the group member
1
2
3
4
5
6
interactive episodes
16
13
4
4
3
8
3
8
3
4
7
8
51
3
2

BMS 19.3

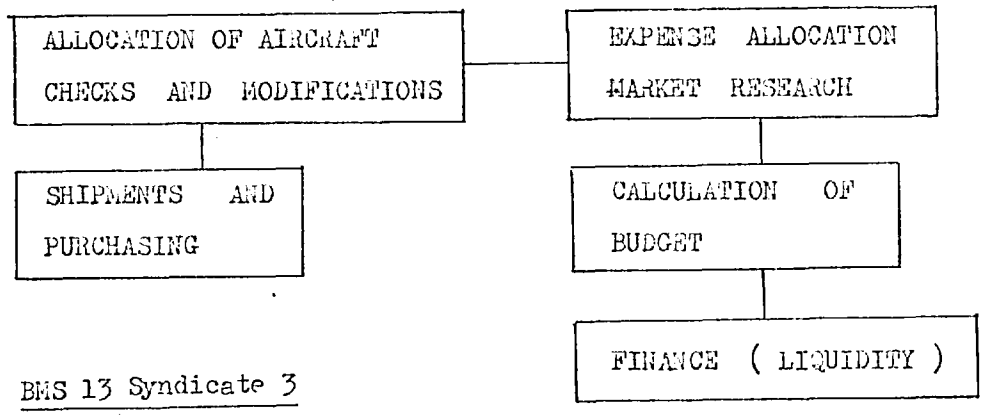
APPENDIX 5.9.



BMS 13 Syndicate 1



BMS 13 Syndicate 2



BMS 13 Syndicate 3

Task Allocations and Organisational Structures adopted by Groups taking part in the BTA Simulation

IDENTIFICATION OF EPISODE TASK TOPIC

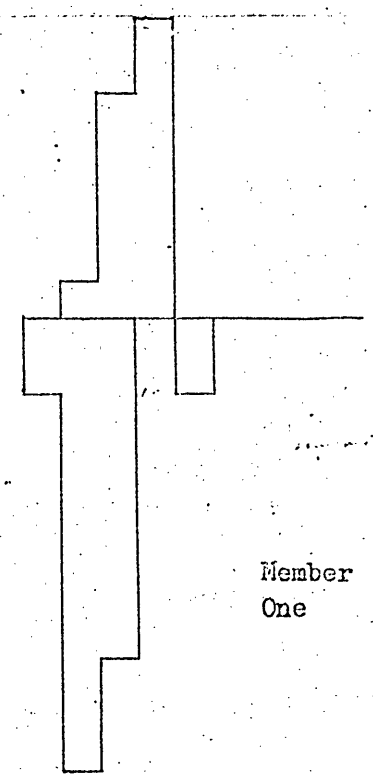
APPENDIX 5.10

USE OF STANDARD MATERIALS RELATED TO MEMBER'S TASKS

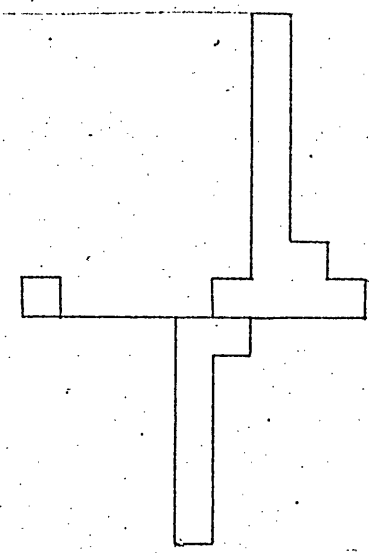
RESULTS FOR

B M S 13

SYNDICATE ONE



Member One



Member Four

KEY

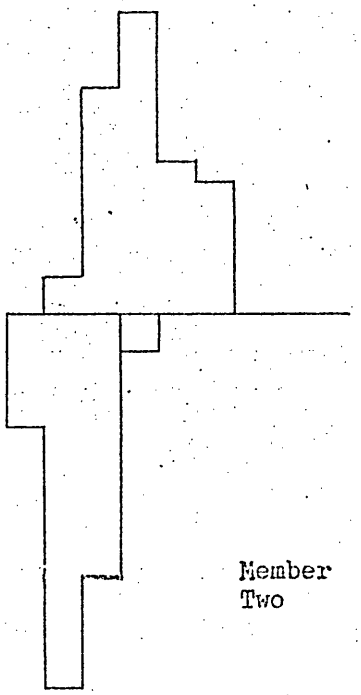
USE OF PRINT-OUT

1 2 3 4 5 6 7 8 9

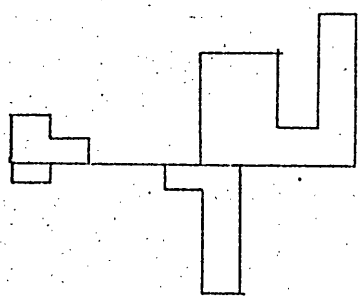
1 2 3 4 5 6

USE OF DECISION FORMS

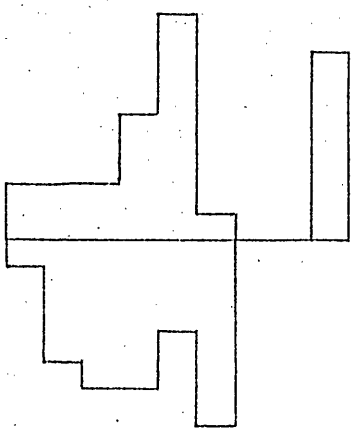
HEIGHT OF HISTOGRAM IN THESE RESPECTIVE POSITIONS INDICATES THE TOTAL FREQUENCY OF THE USE OF THE PARTICULAR PAGES .



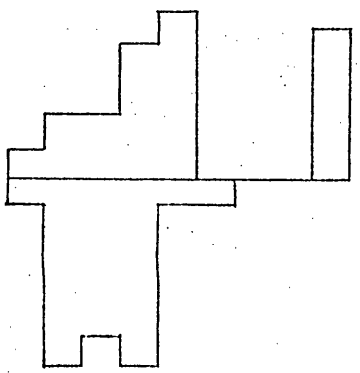
Member Two



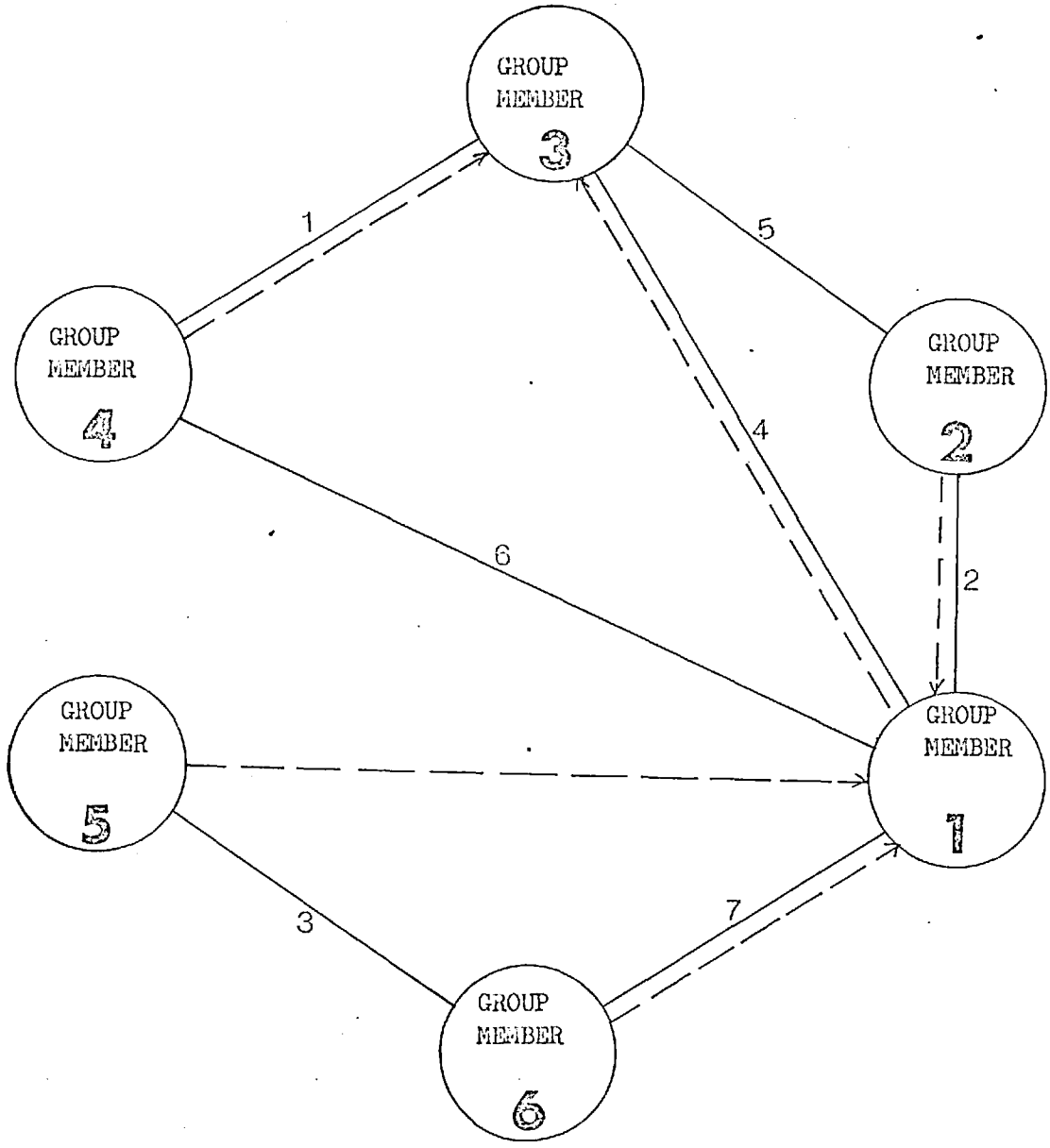
Member Five



Member Three



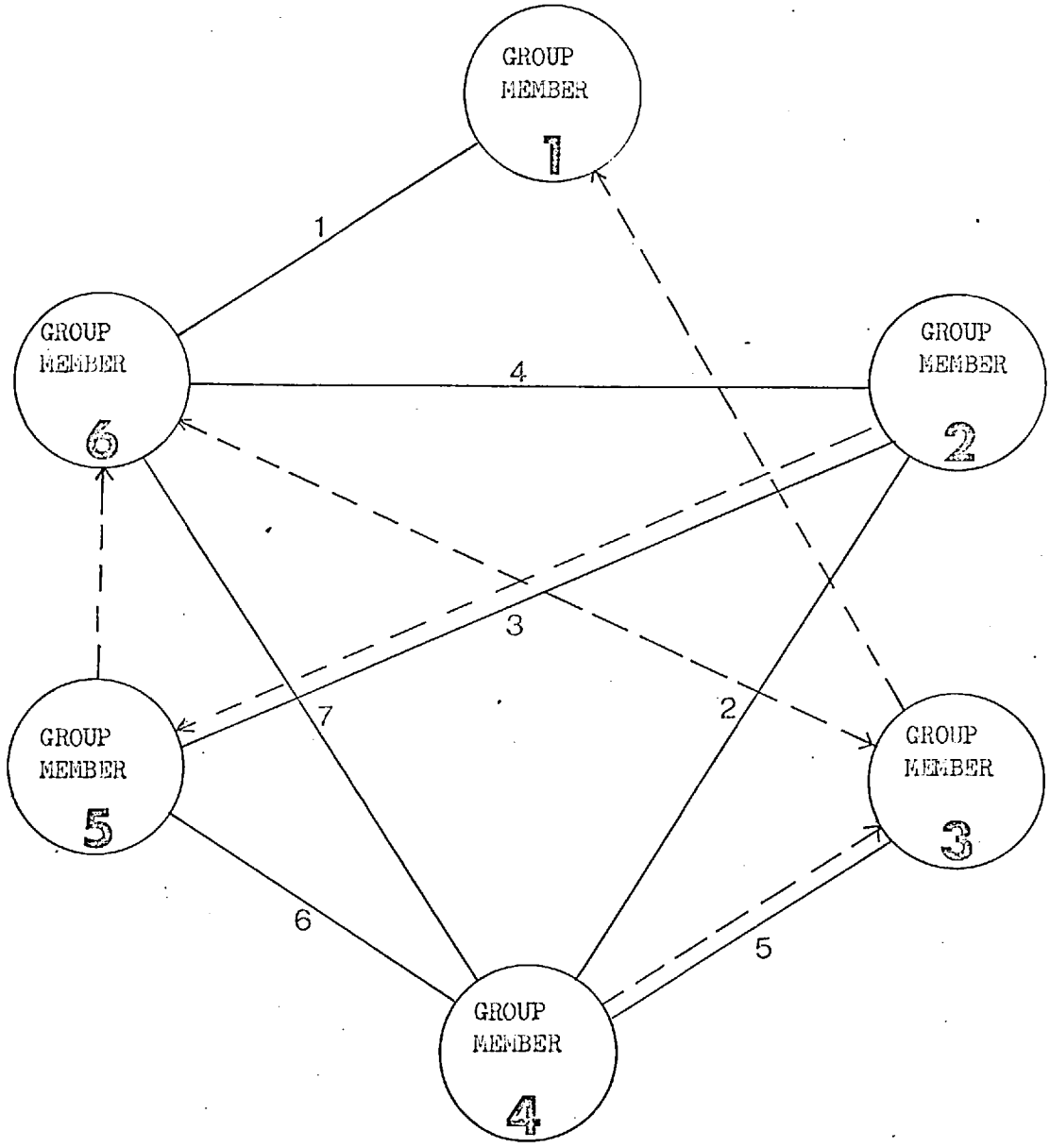
Member Six



___1___ used communication link (number indicates importance,1 equals first etc) .

— — → hierarchy (arrow indicates who is responsible to whom) .

Spatial arrangement , hierarchical structure and communication pattern of B M S course 13 Syndicate 1

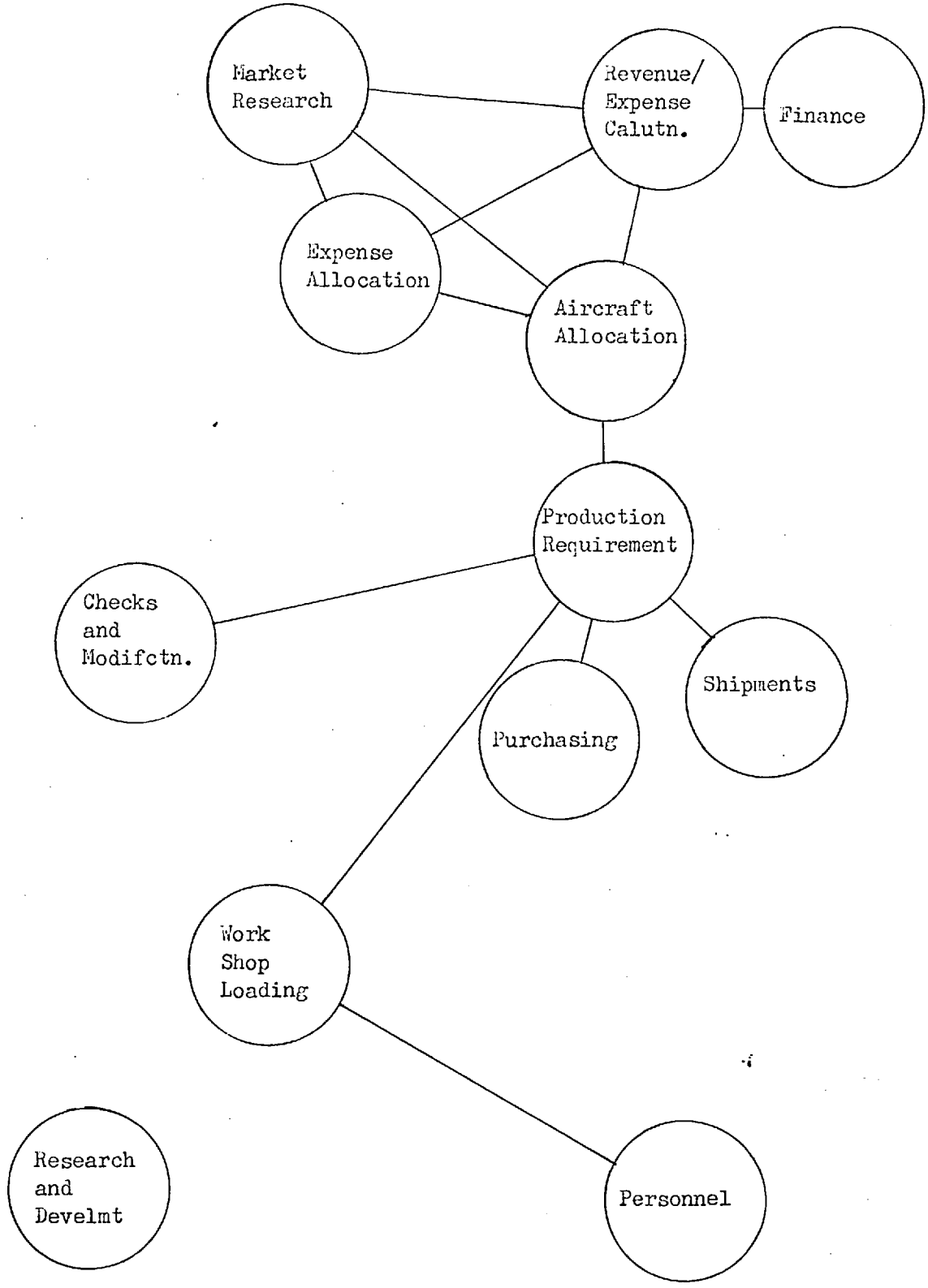


1 used communication link (number indicates rank importance 1 equals most used etc.)

— — → hierarchy (arrow indicates who is responsible to whom)

Spatial arrangment , hierarchical structure and communication pattern

of B M S course 13 Syndicate 3



List of major functions required in the British Training Airline Management Simulation with important required communication for successful Decision-making indicated .

ANALYSIS OF SPATIAL FACTOR EFFECTS ON INTERACTION PATTERN.

Opposites	Nearests	Furthests
2	7	3
	5	6
4	5	6
	6	2
3	5	4
	6	3
2	7	2
	13	3
5	2	7
	5	5
3	13	8
	5	2
8	16	8
	13	4
8	4	7
	4	3
3	3	3
	5	3
1 - 4	1 - 2	1 - 3
	2 - 3	1 - 5
2 - 6	3 - 4	2 - 4
	4 - 5	2 - 5
3 - 5	5 - 6	6 - 3
	6 - 1	6 - 4

One-Way Analysis of Variance

ANALYSIS OF VARIANCE TABLE

ITEM	SS	DF	MS
GRAND TOTAL	1753	45	
GRAND MEAN	1290.69	1	
TREATMENTS	70.7	2	35.35
ERROR	391.611	42	9.32407

F = 3.79126 ON 2 AND 42 DEGREES OF FREEDOM.

EXACT PROB. OF F= 3.79126 WITH (2 , 42) D.F. IS .02978

That is , Significant beyond the .05 Level

Opposites	Nearests	Furthests
3	5.5	3.5
4	6	6
3	5	3.5
3	5.5	4
3	5.5	4.5
4	4.5	2.5
2	6	6.5
5	10	8
3	7.5	6
2	3.5	2.5
3	9	7
5	9	3.5
8	10.5	6
3	14.5	7.5
3	8.5	5
8	4	5
3	3.5	6
3	4	2.5

The table presents the frequency of interaction between individuals and the three categories of neighbours in the groups . The oppposite value is a single value , but the figure for the nearest and furthests is the average of the two pairs of interaction types .

One-Way Analysis of Variance

ANALYSIS OF VARIANCE TABLE

ITEM	SS	DF	MS
GRAND TOTAL	1780.75	54	
GRAND MEAN	1446.67	1	
TREATMENTS	82.1204	2	41.0602
ERROR	251.958	51	4.94036

F = 8.31117 ON 2 AND 51 DEGREES OF FREEDOM.

This F value is Significant at greater than the .001 Level

Group 1	I/A	syndicate 1 BEA	April 1966
2	I/A	syndicate 2 SWR	April 1966
3	I/A	syndicate 3 KLM	April 1966
4	I/A	syndicate 1 SAS	April 1966
5	I/A	syndicate 2 KLM	April 1966
6	I/A	syndicate 3 SWR	April 1966
7	AMS I	syndicate 1	June 1966
8	AMS I	syndicate 2	June 1966
9	AMS I	syndicate 3	June 1966
10	AMS II	syndicate 1	Sept 1966
11	AMS II	syndicate 2	Sept 1966
12	AMS II	syndicate 3	Sept 1966
13	I/A	syndicate 1 SWR	Oct 1966
14	I/A	syndicate 2 DLH	Oct 1966
15	I/A	syndicate 3 KLM	Oct 1966
16	BMS XVI.	syndicate 1	Oct 1966
17	BMS XVI	syndicate 2	Oct 1966
18	BMS XVI	syndicate 3	Oct 1966
19	I/A	syndicate 1 SAS	Nov 1966
20	I/A	syndicate 2 DLH	Nov 1966
21	I/A	syndicate 3 KLM	Nov 1966
22	BMS XVII	syndicate 1	Dec 1966
23	BMS XVII	syndicate 2	Dec 1966
24	BMS XVII	syndicate 3	Dec 1966
25	BMS XVIII	syndicate 1	Jan 1967
26	BMS XVIII	syndicate 2	Jan 1967
27	BMS XVIII	syndicate 3	Jan 1967
28	BMS XIX	syndicate 1	Feb 1967
29	BMS XIX	syndicate 2	Feb 1967
30	BMS XIX	syndicate 3	Feb 1967
31	I/A	syndicate 1 SWR	Sept 1967
32	I/A	syndicate 2 DLH	Sept 1967
33	I/A	syndicate 1 BEA	Aug 1967
34	I/A	syndicate 2 BOAC	Aug 1967
35	I/A	syndicate 3 KLM	Aug 1967
36	I/A	syndicate 1 SAS	June 1967
37	I/A	syndicate 2 SWR	June 1967
38	I/A	syndicate 3 DLH	June 1967
39	I/A	syndicate 1 SAS	May 1967
40	I/A	syndicate 2 BEA	May 1967
41	I/A	syndicate 3 SWR	May 1967
42	I/A	syndicate 1 AL	March 1967
43	I/A	syndicate 2 BOAC	March 1967
44	I/A	syndicate 3 KLM	March 1967
45	AMS	syndicate 1	June 1967
46	AMS	syndicate 2	June 1967
47	AMS	syndicate 3	June 1967
48	I/A	syndicate 3	Sept 1967
49	AMS	syndicate 1	Oct 1967

REFERENCE LIST OF GROUPS TAKING PART IN THE RTA EXERCISE

Group					
	50	AMS	syndicate 2	Oct	1967
	51	AMS	syndicate 3	Oct	1967
	52	BMS XX	syndicate 1	Oct	1967
	53	BMS XX	syndicate 2	Oct	1967
	54	BMS XX	syndicate 3	Oct	1967
	55	BMS XXI	syndicate 1	Dec	1967
	56	BMS XXI	syndicate 2	Dec	1967
	57	BMS XXI	syndicate 3	Dec	1967
	58	BMS XXII	syndicate 1	Feb	1968
	59	BMS XXII	syndicate 2	Feb	1968
	60	BMS XXII	syndicate 3	Feb	1968
	61	AMS	syndicate 1	Sept	1968
	62	AMS	syndicate 2	Sept	1968
	63	AMS	syndicate 3	Sept	1968
	64	AMS	syndicate 1	Oct	1968
	65	AMS	syndicate 2	Oct	1968
	66	AMS	syndicate 3	Oct	1968
	67	I/A	syndicate 1	June	1968
	68	I/A	syndicate 2	June	1968
	69	I/A	syndicate 3	June	1968
	70	BTU	syndicate 1	July	1968
	71	BTU	syndicate 2	July	1968
	72	BTU	syndicate 3	July	1968
	73	AMS	syndicate 1	Aug	1968
	74	AMS	syndicate 2	Aug	1968
	75	AMS	syndicate 3	Aug	1968
	76	BTU	syndicate 1	Aug	1968
	77	BTU	syndicate 2	Aug	1968
	78	BTU	syndicate 3	Aug	1968
	79	I/A	syndicate 1	Oct	1968
	80	I/A	syndicate 2	Oct	1968
	81	I/A	syndicate 3	Oct	1968
	82	MS 1	syndicate 1	Feb	1969
	83	MS 1	syndicate 2	Feb	1969
	84	MS 1	syndicate 3	Feb	1969
	85	SAB	syndicate 1	Dec	1968
	86	SAB	syndicate 2	Dec	1968
	87	SAB	syndicate 3	Dec	1968
	88	I/A	syndicate 1 ILS		1968
	89	I/A	syndicate 2 AL		1968
	90	I/A	syndicate 3 KLM		1968
	91				
	92				
	93				
	94				
	95				
	96				
	97				
	98				
	99				
	100	BMS XXIII	Syndicate 1	April	1968
	101	BMS XXIII	Syndicate 2	April	1968
	102	BMS XXIII	Syndicate 3	April	1968

Various unnamed teams which worked on the B.T.A. Exercise after parameters of the Simulation had been fixed but before its use on Formal management courses.

APPENDIX 6.2

Inter - Decision Period Questionnaire

1. The number of your syndicate is ..... and your number in it is .....

2. The number of the simulation month for which you have just made a decision for is .....

3. How busy in general have you been during the last decision period ?

very busy	busy	quite busy	not very busy	idle
☐	☐	☐	☐	☐

4. Have you been quite sure what the other members of the syndicate expected of you during the last decision period ?

yes	no	in-between
☐	☐	☐

5. Have there been any periods during this last decision period which were not conducive to good decision making ?
- for example , feuding between members .

frequent occasions	some occasions	few occasions	no occasions
☐	☐	☐	☐

6. How has your work been distributed in effort between receiving the simulation print-outs of results from the previous decision and handing in the completed decision forms for this last decisions ?

Give the percentages of total work done by you in each of four hypothetical equal quarters - for example , 0% , 20% , 40% , 40% .

1st Quarter	2nd Quarter	3rd Quarter	Last Quarter
☐	☐	☐	☐

7. DO you consider this distribution to due to ?

	Yes	No
The nature of the tasks you were doing	☐	☐
Dependence on other people's work	☐	☐
Your own choice of effort	☐	☐
Other reasons	☐	☐

If other reasons could you please give a description ?

.....

.....

8. What is the extent of your knowledge of the details of the particular activities with which you have been concerned during the last decision period ? Include in this activities done in conjuction with other people as well as those which you alone are responsible for .

Complete ☐ Good ☐ Adequate ☐ Fair ☐ Poor ☐

9. Would you like to be doing : -

More work ☐ Less work ☐ About the same ☐

10. Would you like to spend : -

More time ☐ Less time ☐ About the same time ☐

doing the activities you did in the last decision period ?

11. What is the extent of your knowledge about the total range of activities being undertaken by your partners in the group ?

Complete ☐ Good ☐ Adequate ☐ Fair ☐ Poor ☐

12. At this stage reached in the AirLine Simulation how do you feel about the number of people in your group . Do you think you would be more efficient if you had : -

2 or 3 more People ? ☐ 1 more Person ? ☐ The same as present ? ☐ 1 less Person ? ☐ 2 or 3 less People ? ☐

13. The general morale of your syndicate at this stage in the simulation is : -

Excellent ☐ Good ☐ Middling ☐ Only Fair ☐ Poor ☐

BTA QUESTIONNAIRE

This is a short questionnaire designed to investigate the kinds of structure adopted by syndicates during the BTA Exercise .

We are attempting to find out how the structure adopted by syndicates relates to the financial success of individual teams playing the " game " . Your co-operation in completing this questionnaire would be appreciated .

We would like you to fill up the answers to questions confidentially and without reference to other members of your syndicate . On the left-hand side of the open questionnaire schedule you will find the questions - your answers are to put on the right-hand side .

For our convenience in dealing with data obtained from this questionnaire we would be grateful if each member of your syndicate would identify him/herself by the use of a number . Before you begin to complete the questionnaire could you therefore have a short meeting with the rest of your syndicate in order to allocate numbers to each member of the group . Could you please use from 1 to the total number in your particular syndicate . The numbers allocated to other people in the syndicate as well as your own number will be required in the questionnaire so could you keep a record of these numbers for reference .

If your group has been observed by the researcher then you will have already been " allocated " a number . Could you , in those circumstances , continue to use that number code .

1. Please give the number of your syndicate on the course

2. How many people are there , in total , in your syndicate

3. Please give your alloted number in the group .

4. This question is rather complex and will require all your attention so please read the instructions and follow the example given with care .

We would like you to identify for every member of the group the particular work tasks with which they were concerned during the exercise . To help you do this we have broken down the likely titles of work topics and have constructed a matrix on the answer page opposite . The horizontal numbers across the top of the matrix refers to the members of your group (i.e. we are using the number code) . The vertical scale is self explanatory : each line corresponds to a particular work activity which may have been performed during the exercise . The description of tasks is almost certainly not that used by your own syndicate . Before completing the matrix (instructions below) spend a couple of further decision periods to see which people are doing which activities .

The matrix is completed by identifying for each individual in the group (1 , 2 , 3 etc.) which activity (1 , 2 etc) they carry out within the group . Please put heavy shading in the relevant boxes . If activities are shared between a number of group members then all the relevant boxes can be shaded . If a change has occured during the run of the exercise please indicate former activities carried out by individuals by light shading .

The example , described below and illustrated by the completed smaller matrix opposite , show indicate what is required .

Syndicate member 1 was carrying out activities 3 and 4
Syndicate members 3 and 4 were carrying out activities 1 , 2 , 5 and 6
Syndicate member 2 was carrying out activity 7
Syndicate member 4 was carrying out activities 8 and 10
Syndicate members 5 and 6 were carrying out activities 9 and 11
Originally member 6 carried out activity 7 together with member 2

You should be able to match this description with the completed matrix opposite . Please now complete the matrix for your own group . Please give your own impressions and do not consult with other members of the group

ANSWERS

1	2	3					
1	2	3	4	5	6	7	8
1	2	3	4	5	6	7	8

List of Activities

Evaluating Seat Configurations possible

Consideration of possible Jet and Prop - allocations to routes

Calculating frequencies for the Routes

Consideration of Checks and Modifications

Estimation of Route Market Potential

Calculating Cost/Revenue Figures

Calculating Marketing , Station Expenses etc

Calculating MU failures at Stations

Calculating Shipments to Stations

Calculating MU and Component needs at Base

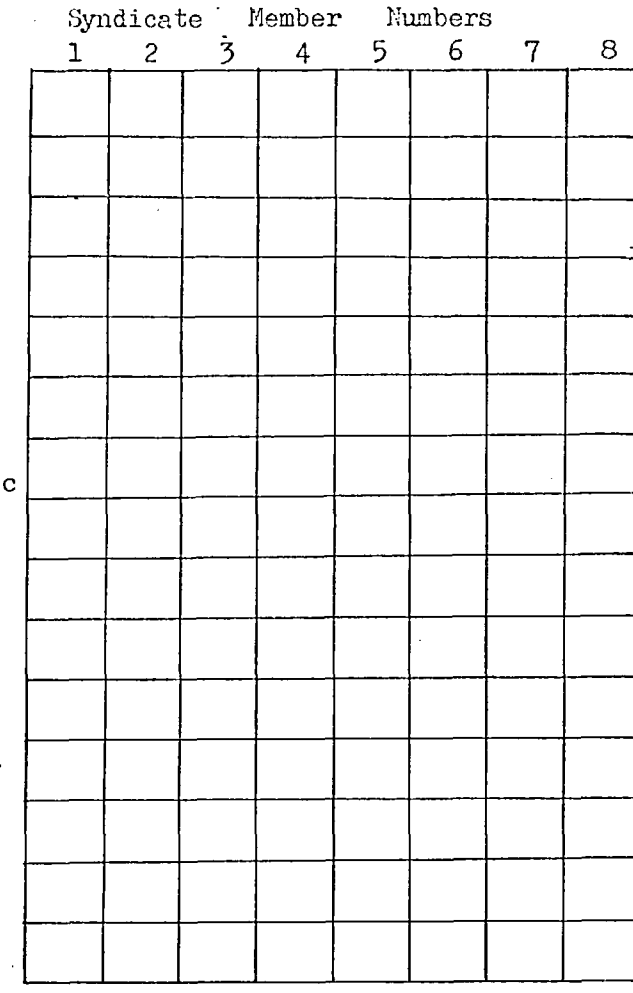
Calculate Purchase Order

Calculate number of required Workshop staff

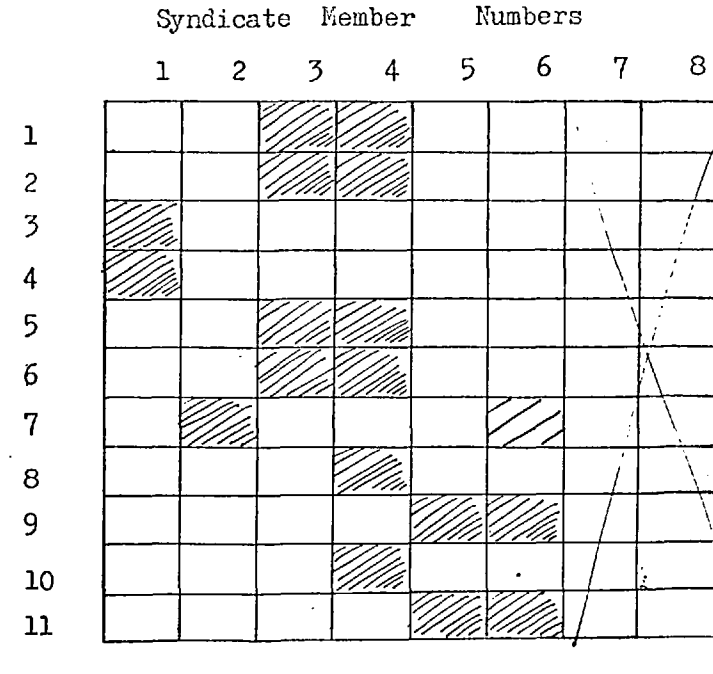
Evaluate Personnel Wastage problem

Evaluate R and D Problem

Co-ordination of Syndicate Activity



EXAMPLE



5. This question is closely related to question 4 . In that question you were asked to identify the work activities of people in your syndicate . Could you now , for each of the fifteen listed work activities , decide whether the decision about these activities were taken by : -

A. Only those people concerned with that activity .

or B. By those people together with others .

or C. By the whole team together .

or D. By individuals who were connected with making calculations about the respective activity .

Again you will probably have to confirm your opinions during the next few decision periods .

6. Taking into account only your final adjusted cumulative profit (or loss) whow successful do you think your syndicate has been ?

7. How about the success of the other two groups ? Please identify their numbers .

8. What do you think was the reason for your financial success ? Indicate yes or no - or leave blank if you are unable to judge - against each of the following .

A.Good members in your particular syndicate
B.Good allocation of activities and responsibilities
C.Actions of your Chairman (if you had one)
D.Good co-ordination of various tasks
E.Other reasons

if " Other reasons " please specify these .

9. What contributed to your syndicate not doing as well as it might have done ?

A.Capabilities of your syndicates members (too many engineer etc.)
B.Poor allocation of activities and responsibilities
C.Actions of your Chairman (if you had one)
D.Too much individual working with little co-ordination
E.Other reasons

if " Other reasons " please specify these .

10. What , apart from obtaining a profit (or loss) , did your particular syndicate get out of the BTA Exercise ?

A.Experience of Team work in general
B.Learnt how to cope with difficult situations
C.Experience of General Airline Management Decisions
D.How to do better in any future try at the BTA Exercise
E.Other benefits

if " Other benefits " please specify these .

5.

Decision associated with each activity

Specific Activities - details in question 4	type A	type B	type C	type D
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

extremely successful	very successful	successful	adequate	fair	un-successful	very un-successful
6. ☐	☐	☐	☐	☐	☐	☐
7. ☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐

8.

	yes	no
A	☐	☐
B	☐	☐
C	☐	☐
D	☐	☐
E	☐	☐

9.

A	☐	☐
B	☐	☐
C	☐	☐
D	☐	☐
E	☐	☐

10.

A	☐	☐
B	☐	☐
C	☐	☐
D	☐	☐
E	☐	☐

Air Transport Staff College , East Burnham

Basic Management Studies Course

BMS 23 Ist Residential Stage April 1968

List of Course Members		Location
Areas and Outstations		
M. EONA	Station Superintendent	Turin
F.T. NOUBANI	Senior Sales Representative	Beirut
T. INALOGLU	Station Superintendent	Ankara
Commercial and Sales		
J. WARD	Reservations Services Officer	W L A T
D.A. GROSE	Holiday Travel Assistant	W L A T
M.J. LEE	A T L B Officer	Bealine House
D.J. RAYWORTH	Asst. Supvr. Telephone Sales	W L A T
P.N. NORTH	Passenger Sales Representative	W L A T
Engineering		
R. McCALLUM	Section Inspector	L A P Base
W.K. MAYNARD	Section Inspector	L A P Base
J.S. FOWLER	Engineering Instructor	Southall T C
W.G. GOLDSMITH	Technical Author	L A P Base
Finance and Property		
A.S. BARNETT	Supervisor E D P Control Unit	Bealine House
Traffic		
J.F. Christison	Duty Officer	Gatwick A P
A.R. Rawlin	Duty Supervisor Export Cargo	L H R
A. Whitehead	Asst. Duty Officer	W L A T
R.P. Brown	Senior Supervisor Import Terminal	L H R
J.D. Fowler	Traffic Despatcher	L H R
F.P. Quinn	Load Controller	L H R
S.L.M. Bolton	Supervisor International Check-in	L H R
C H. Paterson	Passenger Setvices Officer	L H R

Air Transport Staff College , East Burnham

Advanced Management Studies Course

AMS 2 8/20 October 1967

List of Course Members		Locations
Areas and Outstations		
Dr. B. HOLLAND	Accounting Superintendent	Hamburg
A.C. HUTCHINSON	Duty Officer	Belfast
W.S. CUMMINGS	Cargo Officer	Belfast
W. DOMKOWSKI	Supplies and Services Superintendent	Berlin
W. GRUND	Assistant Station Superintendent	Berlin
G. SPRENGLER	Sales Officer Bonn/Cologne	Cologne
F. LOHAUS	Sales Officer	Frankfurt
Commercial and Sales		
J. ASHDOWN	Reservations Inspector	W L A T
C. DANIELS	Market Research Superintendent	W L A T
T.W. MITCHELL	Senior Corres. Sales Officer	W L A T
R.W. STUBBS	Cargo Sales Representative	W L A T
Engineering		
G. ROGERS	Engineering Instructor Leader	Southall T C
R. JOHNSTON	Asst. Chief Draughtsman	L A P Base
B. JACKSON	Senior Engine Development Officer	L A P Base
R.G. LARKINS	Section Leader , Production Engineering	L A P Base
Flight Operations		
S.G. GRIFFIN	Accounting Superintendent	Bealine House
Capt. W.L. HARLOW	Asst. Flight Manager	L H R
Capt. I.A.C.SLIGHT	Asst. Flight Manager	L H R
J.C. DENYER	Administration Officer	L H R
Traffice		
J.MEDWAY	Passenger Duty Officer	L H R
G. HOWELLS	Senior Passenger Officer	L H R
I. POWELL	Senior Traffic Despatcher	L H R

Air Transport Staff College , East Burnham

Inter-Airline Management Exercise

June 5 - 9 , 1967

List of Exercise members

Scandanavian Airways System (SAS)

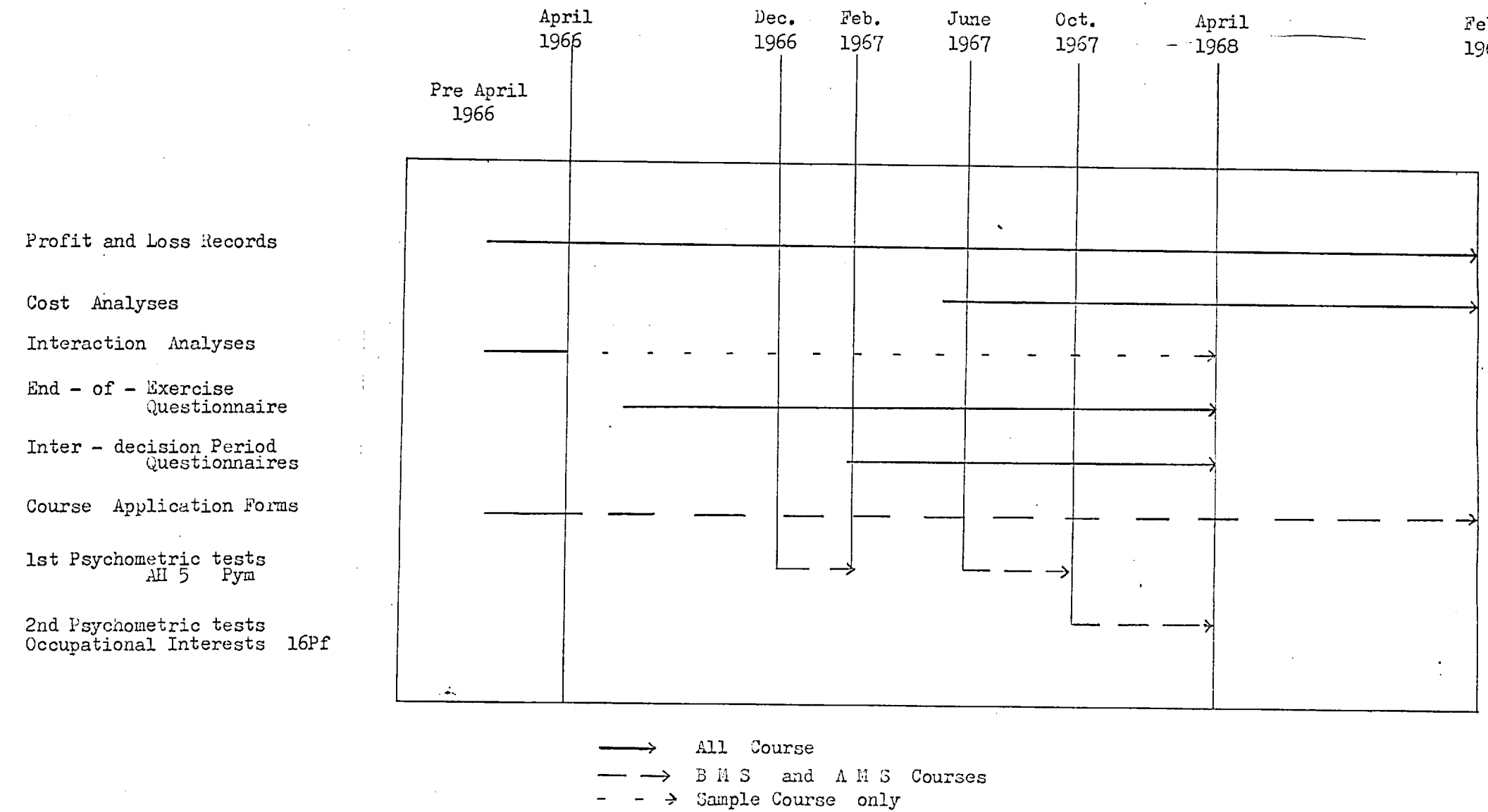
G. RIBBING	Programme Planning - Head Office
A. LOOW	Manager , Maintenance Division - Head Office
M. HENRIKSEN	Manager , Crew Control Copenhagen
D. THYGESEN	Sales Administration Officer - Head Office
G. BESKOW	Traffic Programme Officer - Head Office
B. ODLUND	Manager , Economics Department - Region Sweden Office
S. DAHLGREN	Sales Department - Region Sweden Office
A. HELMERSEN	Inventory Control Division

Swissair (SWR)

W. OEHNINGER	Balance Sheet and Investment Control
P. RHINOW	Cargo Reservation
K. MEISTER	General Manager , Passenger Sales
W. BORER	Administration Operations Planning
R. SCHRIBER	Crew Rotations
U. BEETSCHEN	Traffic Planning
D. ESCHER	Commercial Research
J.P. CHETELAT	Station Control

Deutsches Lufthansa (DLH)

Dr. K.W. AMBROSIUS	Manager , Financial and Personnel Administartion Beirut
H. FLINTROP	Asst. Sales Manager
F. HOELZER	Manager , Financial and Personnel Administration Jo'burg
H. JOSEFOWSKI	District Sales Manager , Athens
H. POLOSCHEK	Asst. Manager , Adult Education
R. THIESING	Asst. Manager , Aircraft Maintenance
H. WALLER	Deputy Station Manager , Frankfurt
G. WASCHEK	Manager , Electronic Data Processing



Use of Instruments in the Research with the B T A simulation Groups April 1966 / February 19

British Training Airline

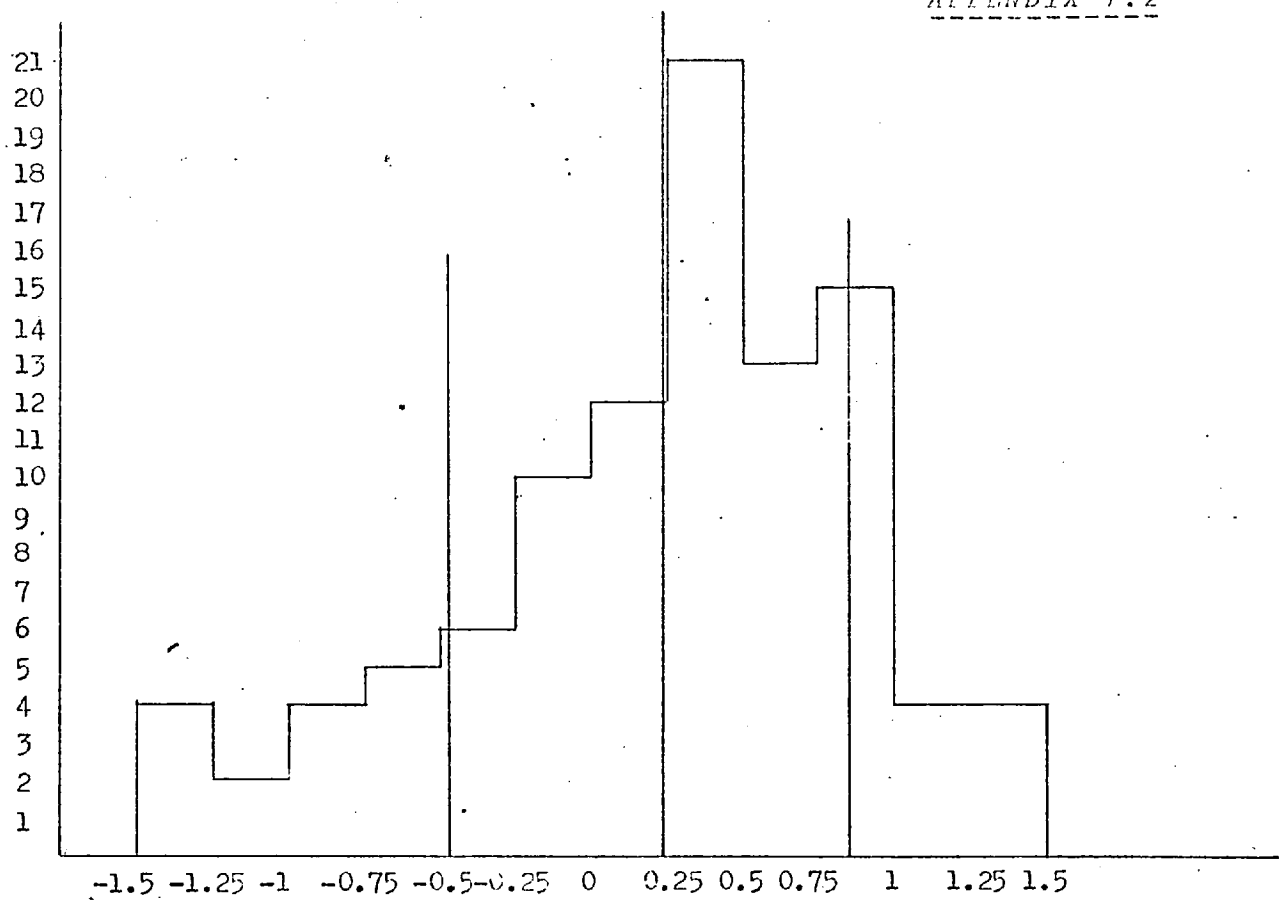
PROFIT AND LOSS STATEMENT

Commencing Stock £ 4 925 000 . All figures below in £ 000 s

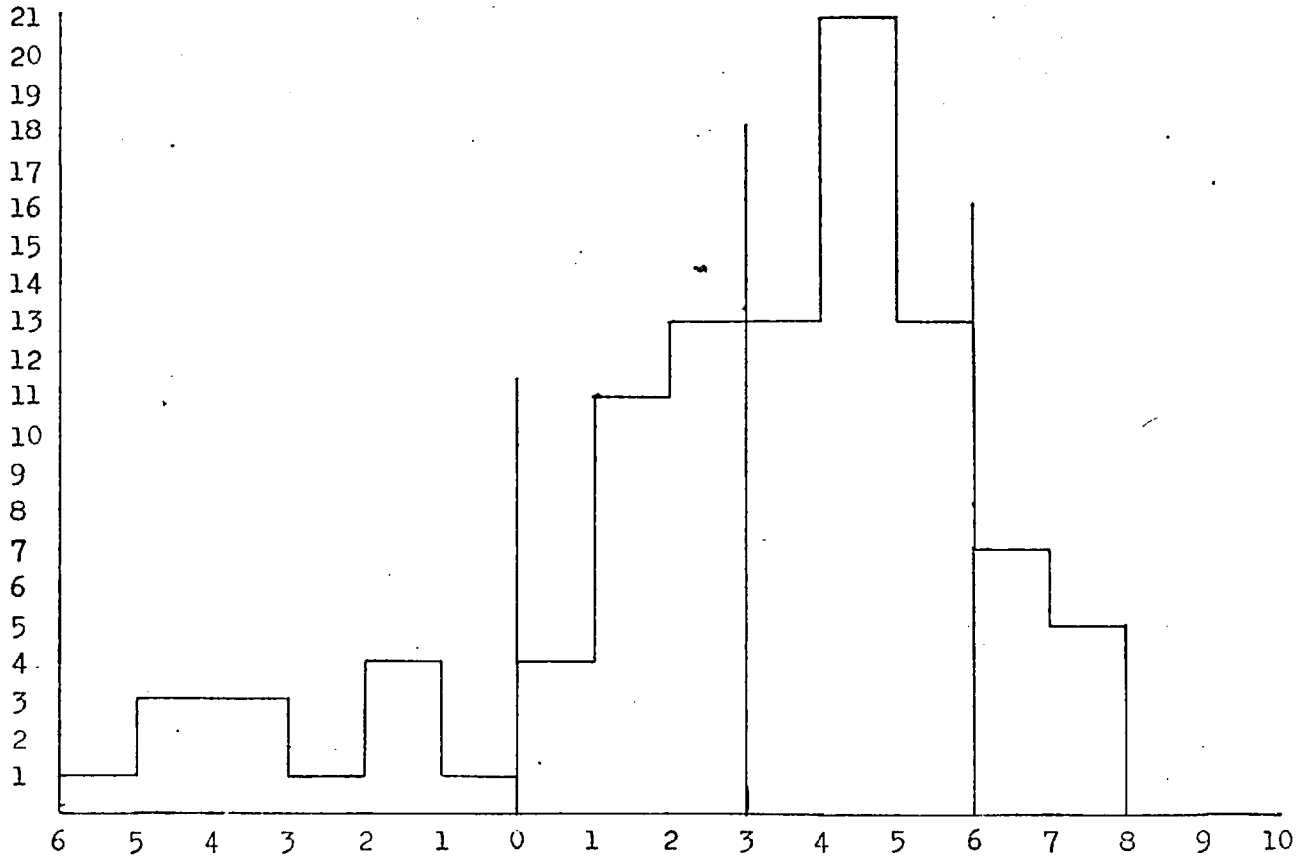
	ITEM	Company 1	Company 2	Company 3
This section completed at the end of decision period 1	P/L Month 1	719	254	-955
	Purchasing	3	5	
	Adj. Month P/L	722	259	-955
	Cumulative P/L	719	254	-955
	Closing Stock	4652	4662	4390
	Change in Stock	-273	-263	-535
	Adj. Cum. P/L	446	-9	-1490
This section completed at the end of decision period 2	P/L Month 2	1552	787	-1453
	Purchasing		2	
	Adj. Month P/L	1552	789	-1453
	Cumulative P/L	2271	1040	-2408
	Closing Stock	3908	4423	4107
	Change in Stock	-1017	-502	-818
	Adj. Cum. P/L	1253	538	-3226
This section completed at the end of decision period 3	P/L Month 3	1728	1439	-1244
	Purchasing	243	30	
	Adj. Month P/L	1971	1469	-1244
	Cumulative P/L	3999	2480	-3652
	Closing Stock	3723	3933	3714
	Change in Stock	-1202	-992	-1211
	Adj. Cum. P/L	2797	1488	-4863

Extract from the Profit and Loss Statement displayed to team members between decision periods in the BTA Exercise . The example shown is from the MS course 1 , February 1969 .

APPENDIX 7.2



Profit obtained by groups during the Trial Decision Period in £ 000, 000s



Cumulative , Adjusted , Profit achieved by Groups up to the End of Period Eight .

(in £ 000, 000s)

Group	X	Y (Actual)	Y (Predicted)
	803	2141	5102.6
	533	4285	4147.43
	745	4590	4897.41
	354	4278	3514.19
	343	2850	3475.28
	763	4862	4961.09
	-511	1333	454.115
	1254	6187	6698.08
	1334	4152	6981.1
	-220	1602	1483.57
	252	3049	3153.35
	60	67	2474.12
	542	3341	4179.27
	-24	3437	2176.95
	1293	6387	6836.05
	1102	4114	6160.36
	-122	2431	1830.26
	-352	2789	1016.6
	-294	2975	1221.79
	369	4760	3567.25
	1332	5437	6974.02
	890	2889	5410.38
	-1117	-4278	-1689.71
	700	5200	4738.22
	195	613	2951.7
	128	1509	2714.68
	999	6530	5795.98
	-742	-1472	-363.084
	834	7034	5212.27
	718	6542	4801.9
	353	4224	3510.65
	-375	1121	935.237
	755	7549	4932.79
	1051	7465	5979.94
	-790	2383	-532.892
	471	2860	3928.1
	203	1612	2980.
	359	3182	3531.88
	702	3745	4745.3
	753	4499	4925.72
	830	4341	5198.12
	557	4800	4232.33
	332	3521	3436.36
	845	5346	5251.18
	890	5549	5410.38
	416	4885	3733.52
	783	5362	5031.85
	-375	1002	935.237
	600	3248	4384.45
	458	4840	3882.11
	493	3408	4005.92
	1080	5364	6082.53
	-34	2275	2141.58
	899	3543	5442.21
	-267	-1253	1317.3
	290	1962	3287.78
	-162	-1179	1688.76
	249	7241	3142.74
	-749	1038	-387.848
	206	1410	2990.62
	519	1472	4097.9

Group	X	Y (Actual)	Y (Predicted)
	546	6495	4193.42
	853	3910	5279.48
	892	4655	5417.45
	250	4201	3146.27
	-871	2575	-819.442
	-1098	476	-1622.49
	-1492	-6746	-3016.33
	768	3501	4978.78
	693	5142	4713.46
	-1362	-3540	-2556.43
	450	5396	3853.81
	106	1472	2636.85
	11	6495	2300.77
	230	3910	3075.52
	462	4655	3896.26
	-105	4201	1890.4
	-1054	2575	-1466.83
	484	4801	3974.09
	163	5122	2838.5
	348	5407	3492.96
	446	5371	3839.65
	-9	3480	2230.02
	-1490	-3543	-3009.25
	719	7172	4805.44
	203	4870	2980.
	-954	-4256	-1113.07
	-583	2102	199.404
	374	5207	3584.94
	385	4872	3623.86
	-661	-3865	-76.5339
	162	-1812	2834.96
	-146	-548	1745.36
	-783	-2558	-508.128
	-1131	-4318	-1739.23
	437	6391	3807.82
	-273	1486	1296.08
	-21	2120	2187.57
	353	4202	3510.65

Linear Regression

SOURCE OF VARIATION	D. F.	SUM OF SQUARES	MEAN SQUARE
TOTAL	98	859027154	8.76558E+06
REGRESSION	1	5.26315E+08	5.26315E+08
ERROR	97	3.32712E+08	3.43003E+06

VARIABLE	MEAN	VARIANCE	STD DEVIATION
TRYOUT MNTH PROFITX	210.152	429129.	655.079
MNTH 8 TOTAL PROFITY	3005.3	8.76558E+06	2960.67

PARAMETER	VALUE
A	2261.86
B	3.53766

INDEX OF DETERMINATION	.612687
CORRELATION COEFFICIENT	.782743
F-RATIO TEST STATISTIC	153.443

B M S Group Population

Group	X	Y
16	1102	4114
17	-122	2431
18	-352	2789
22	890	2889
23	-1117	-4278
24	700	5200
25	195	613
26	128	1509
27	999	6530
28	-742	-1472
29	834	7034
30	718	6542
52	1080	5364
53	-34	2275
54	899	3543
55	-269	-1253
56	290	1962
57	-162	-1179
58	249	7241
59	-747	1038
60	206	1410
85	719	7172
86	203	4870
87	-954	-4256

Linear Regression

SOURCE OF VARIATION	D. F.	SUM OF SQUARES	MEAN SQUARE
TOTAL	23	265490790	1.15431E+07
REGRESSION	1	1.75887E+08	1.75887E+08
ERROR	22	8.96041E+07	4.07292E+06

VARIABLE	MEAN	VARIANCE	STD DEVIATION
TRYOUT MONTH PROFIT	196.375	437422.	661.379
MONTH 8 TOTAL PROFIT	2587	1.15431E+07	3397.51

PARAMETER	VALUE
A	1765.91
B	4.18121

INDEX OF DETERMINATION	.662496
CORRELATION COEFFICIENT	.813939
F-RATIO TEST STATISTIC	43.1845

A M S Groups Population

Group	X	Y
7	-511	1333
8	1254	6187
9	1334	4152
10	-220	1602
11	252	3049
12	60	67
45	890	5549
46	416	4885
47	783	5362
49	600	3248
50	458	4840
51	493	3408
61	519	1472
62	546	6495
63	853	3910
64	892	4655
65	250	4201
66	-871	2575
73	106	1472
74	11	6495
75	230	3910
82	446	5371
83	-9	3480
84	-1490	-3543

Linear Regression

SOURCE OF VARIATION	D. F.	SUM OF SQUARES	MEAN SQUARE
TOTAL	23	121669977	5289999
REGRESSION	1	6.11719E+07	6.11719E+07
ERROR	22	6.04981E+07	2.74991E+06

VARIABLE	MEAN	VARIANCE	STD DEVIATION
TRYOUT MONTH PROFIT	303.833	404324.	635.865
MONTH 8 TOTAL PROFIT	3507.29	5289999	2300.

PARAMETER	VALUE
A	2728.03
B	2.56476

INDEX OF DETERMINATION	.502769
CORRELATION COEFFICIENT	.709062
F-RATIO TEST STATISTIC	22.245

Interarline Groups Population

Group	X	Y
1	803	2141
2	533	4285
3	745	4590
4	354	4278
5	343	2825
6	763	4862
13	542	3341
14	-24	3437
15	1293	6387
19	-294	2975
20	369	4760
21	1332	5437
31	353	4224
32	-375	1121
33	755	7549
34	1031	7465
35	-790	2383
36	471	2860
37	203	1612
38	359	3182
39	702	3745
40	753	4499
41	830	4341
42	557	4783
43	332	3521
44	845	5346
48	-21	1002
67	-1098	476
68	-1492	-6746
69	768	3501
79	484	4802
80	163	5122
81	348	5407
88	-583	2102
89	374	5207
90	385	4872

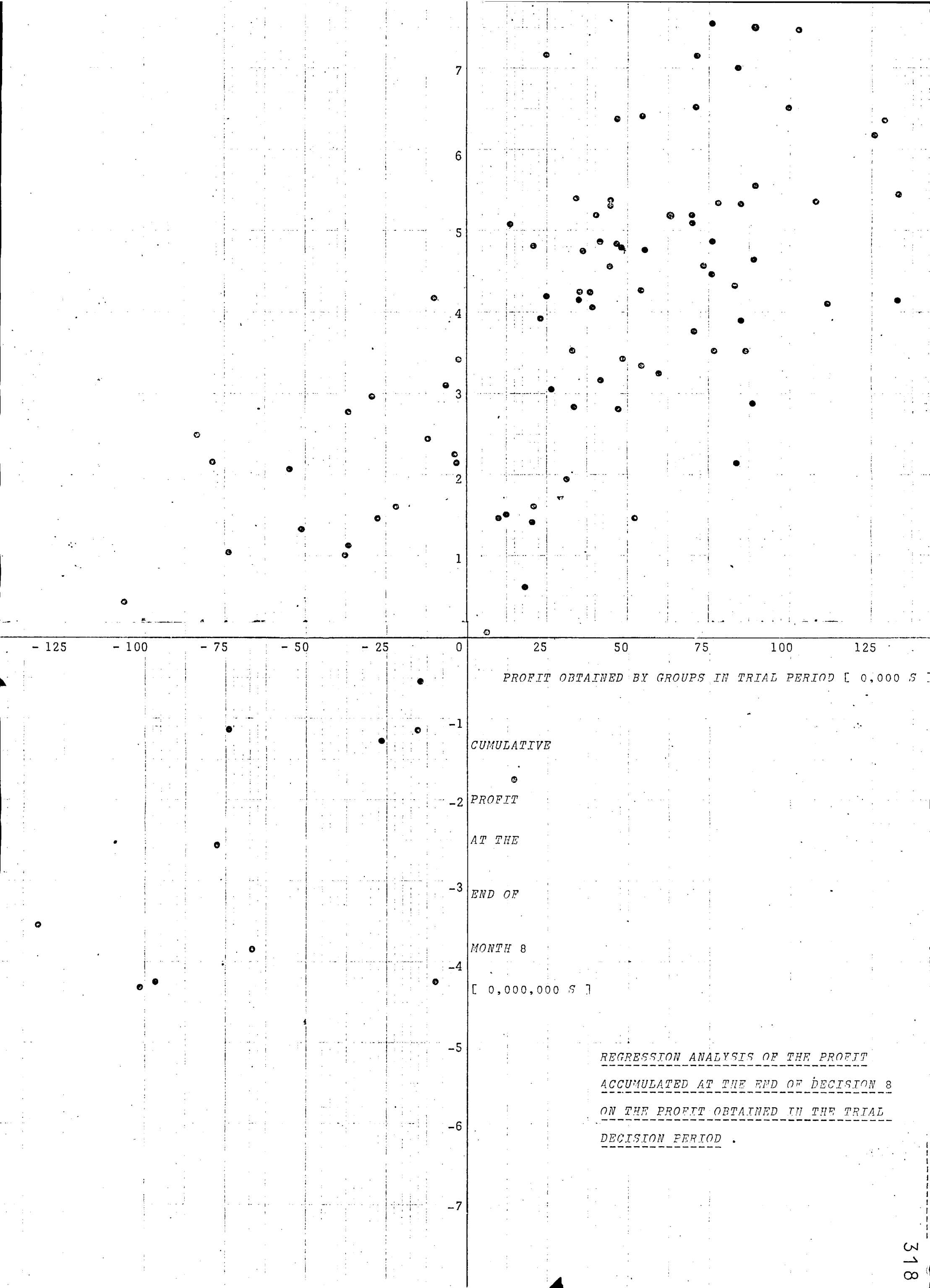
Linear Regression

SOURCE OF VARIATION	D. F.	SUM OF SQUARES	MEAN SQUARE
TOTAL	35	2.05166E+08	5.86189E+0
REGRESSION	1	126761229	126761229
ERROR	34	7.84050E+07	2.30603E+0

VARIABLE	MEAN	VARIANCE	STD DEVIATION
(X) TRYOUT MONTH PROFIT	336.472	372163.	610.051
(Y) MONTH 8 TOTAL PROFIT	3658.17	5.86189E+06	2421.13

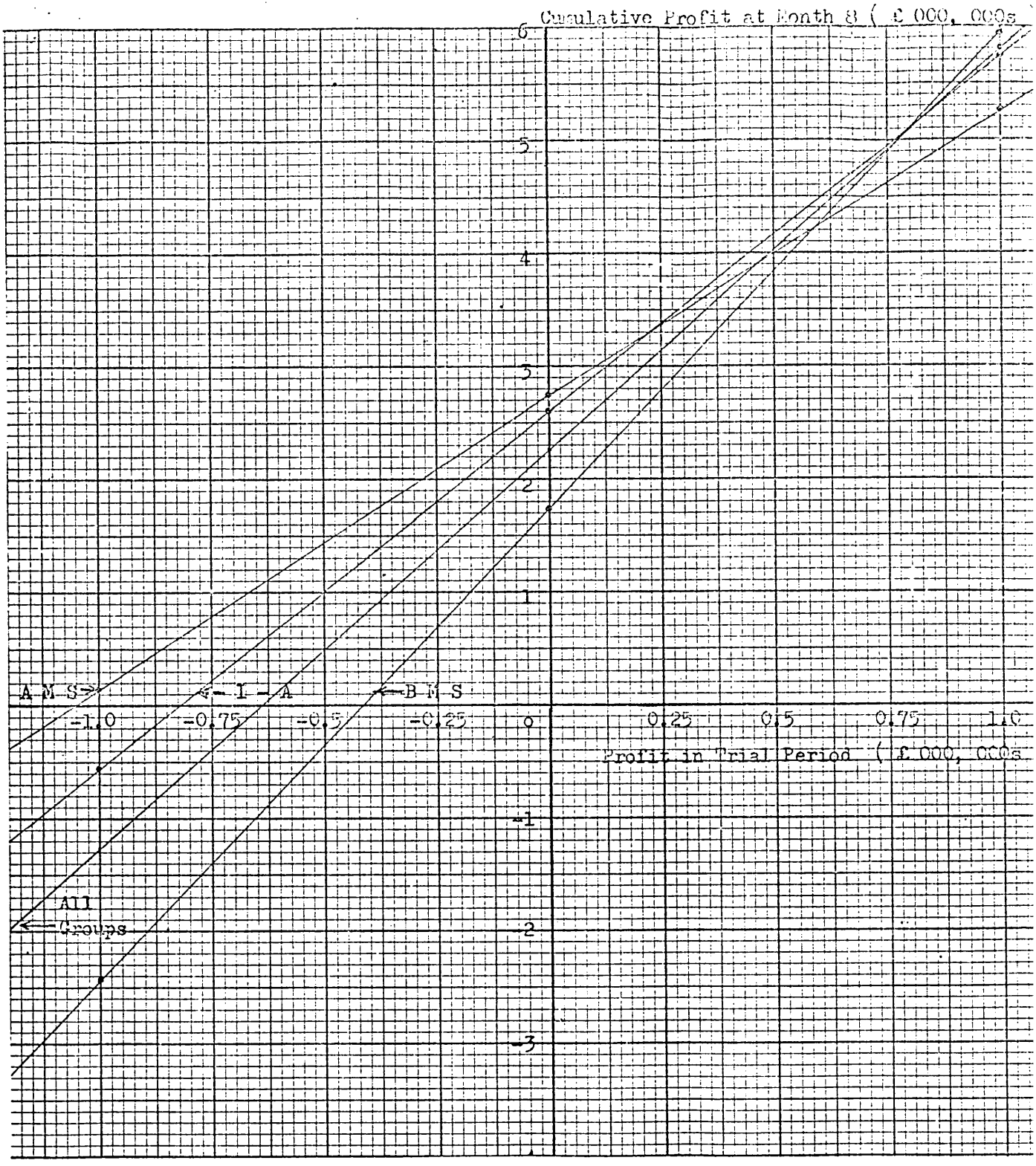
PARAMETER	VALUE
A	2608.52
B	3.11956

INDEX OF DETERMINATION	.617847
CORRELATION COEFFICIENT	.786032
F-RATIO TEST STATISTIC	54.9695



REGRESSION ANALYSIS OF THE PROFIT ACCUMULATED AT THE END OF DECISION 8 ON THE PROFIT OBTAINED IN THE TRIAL DECISION PERIOD .

APPENDIX 7.8



Regression Lines of the Cumulative Profit at the end of Month Eight (Dependent Variable) on the Profit obtained during the Trial Period for :

All Groups using the B T A Exercise (N 99)

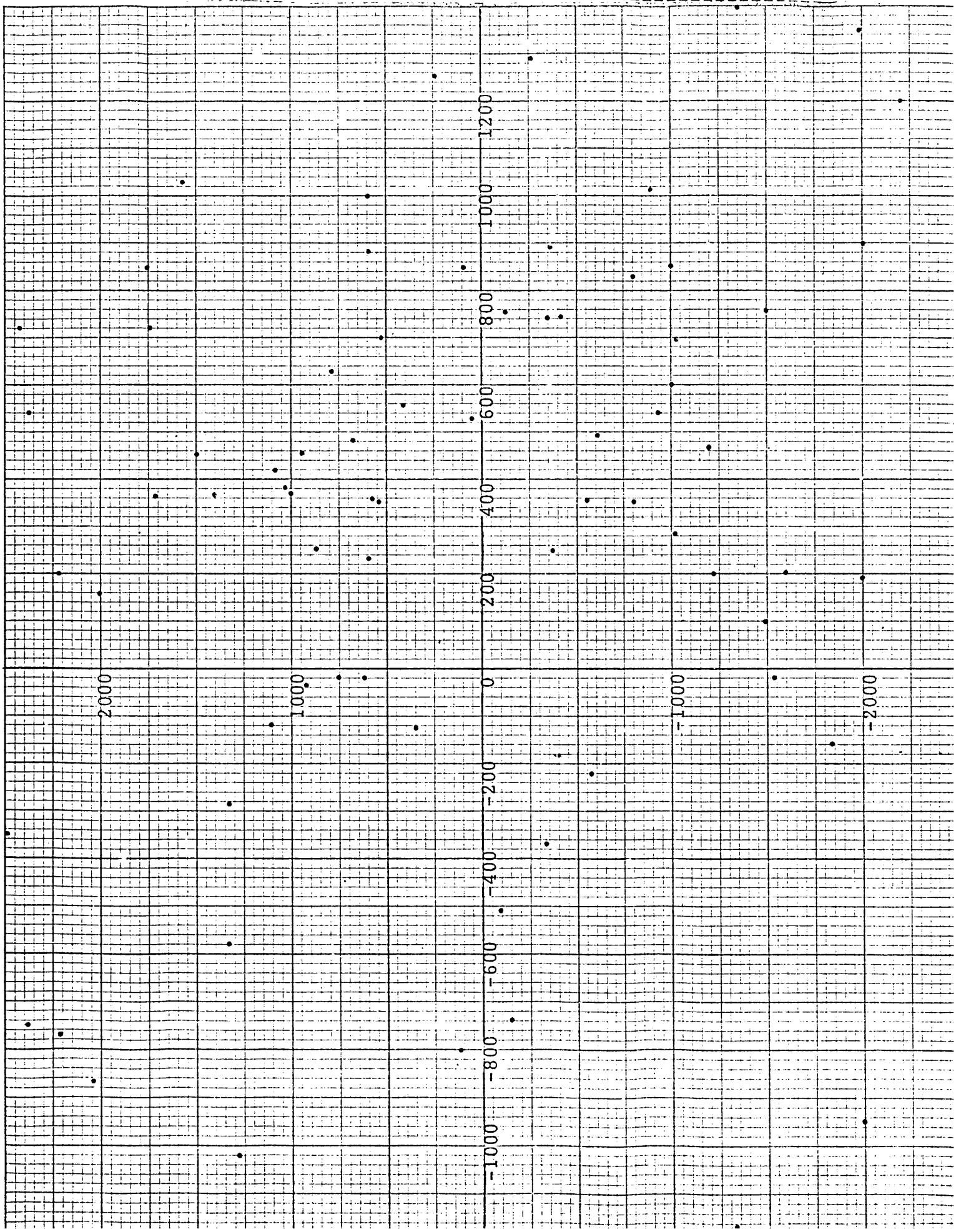
Basic Management Studies Course Groups (N 24)

Advanced Management Studies Course Groups (N 24)

Inter-Airline Exercise Groups (N 36)

APPENDIX 7.9

[OBSERVED - EXPECTED] AGAINST EXPECTED FINAL PROFIT



REGRESSION ANALYSIS CUMULATIVE PROFIT MONTH 12 ON THE CUMULATIVE PROFIT FOR MONTH 8 .

Group	Total Profit at 8 Months (X)	Total Profit at 12 Months (Y)
7	1333	4336
8	6187	1425
9	4152	1691
10	1602	719
11	3049	1961
12	67	2427
16	4114	3269
17	2431	4709
18	2789	1915
22	2889	462
23	-4278	-8318
24	5200	1403
25	613	2288
26	1509	2354
27	6530	4084
28	-1472	-5713
29	7034	7334
30	6542	6640
49	3248	1362
50	4840	4502
51	3408	3249
55	-1253	-2230
56	1962	2276
57	-1179	-3312
58	7241	9294
59	1038	755
60	1410	412
61	1472	-824
62	6495	7756
63	3910	2806
64	4655	5240
65	4201	1202
66	2575	843
73	1472	-824
74	6495	4756
75	3910	2806

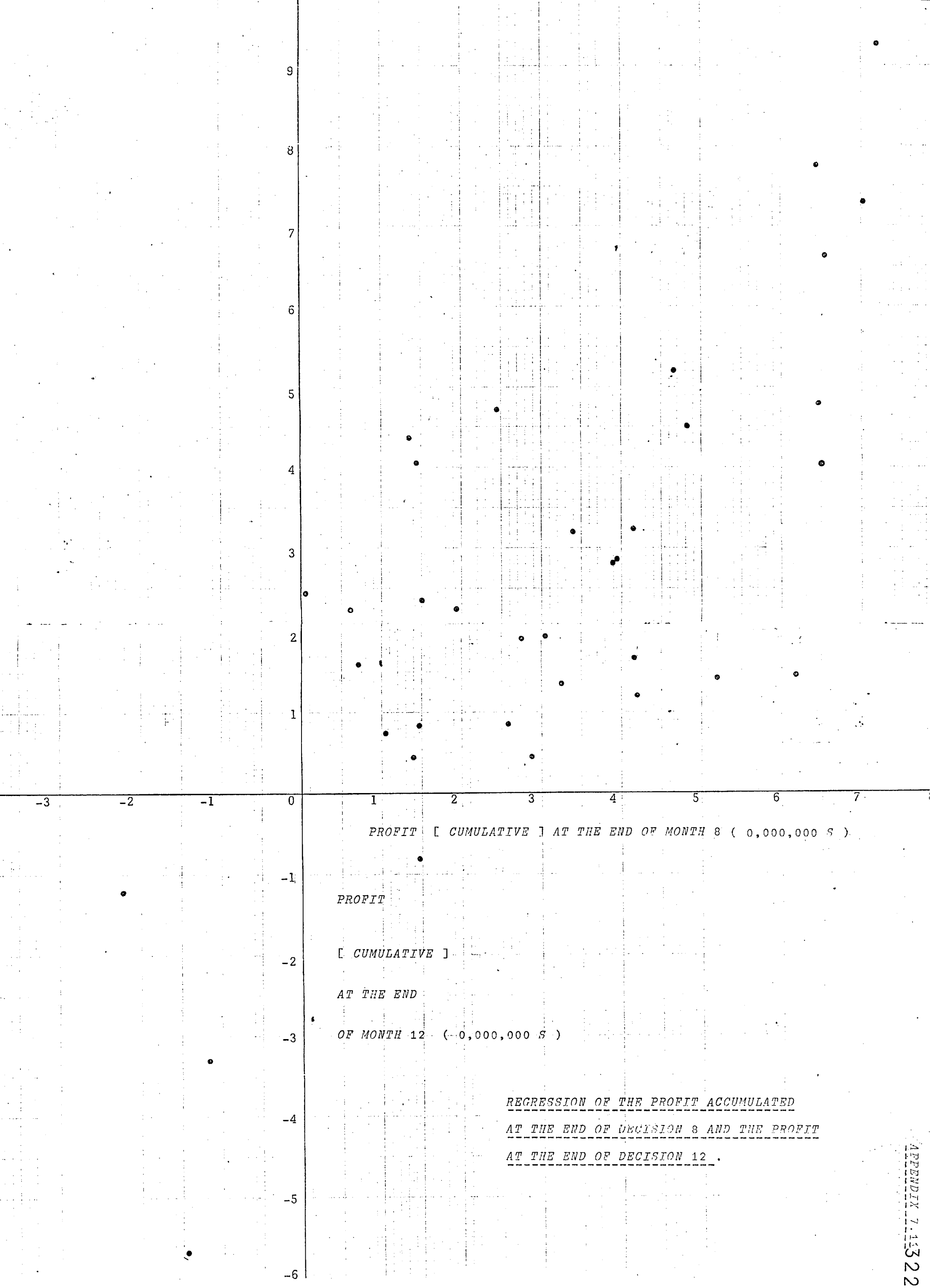
Linear Regression

SOURCE OF VARIATION	D. F.	SUM OF SQUARES	MEAN SQUARE
TOTAL	35	421976004	1.20565E+07
REGRESSION	1	2.57030E+08	2.57030E+08
ERROR	34	1.64946E+08	4.85136E+06

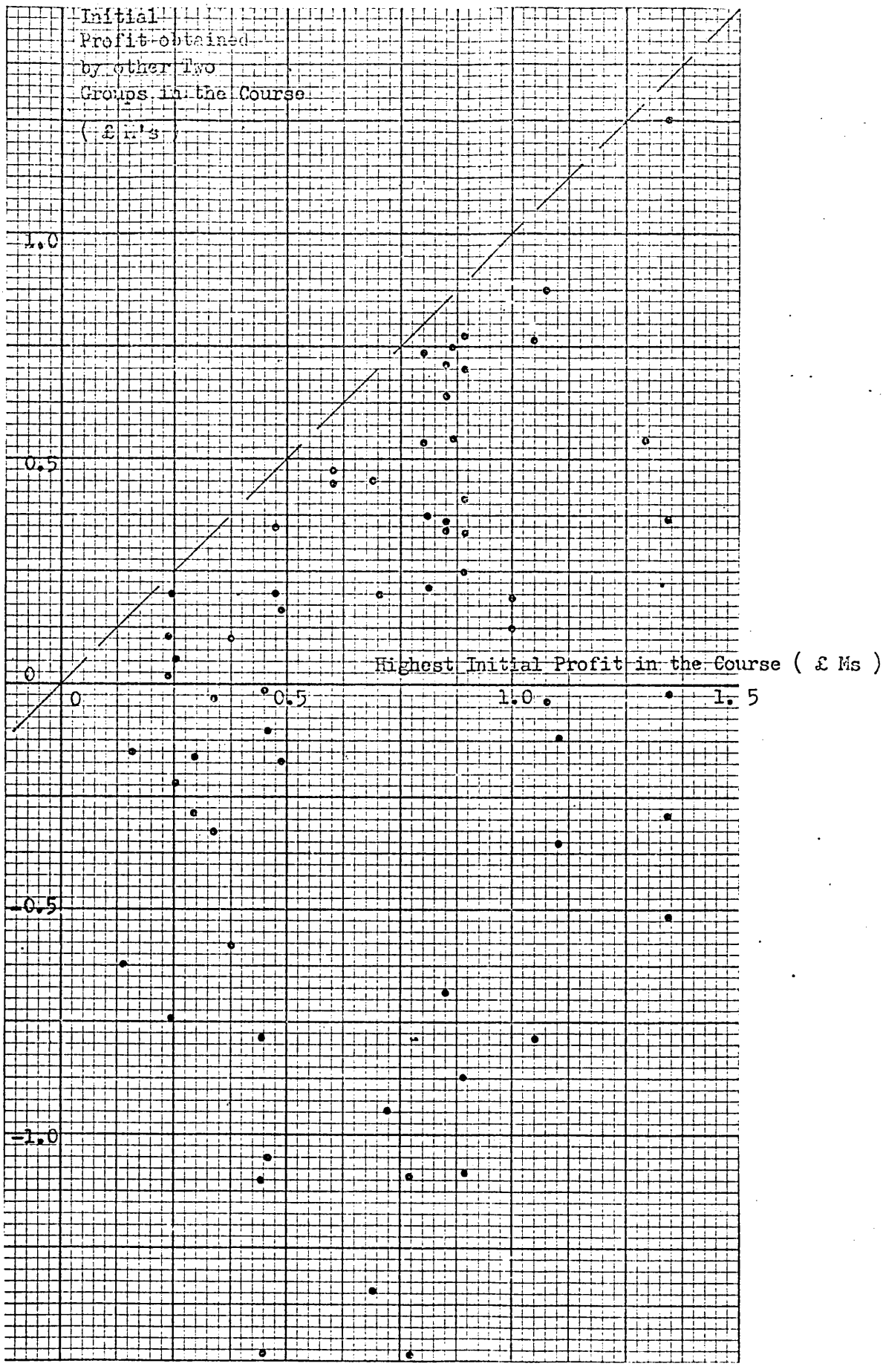
VARIABLE	MEAN	VARIANCE	STD DEVIATION
TOTAL PROFIT AT 8 MNTHS	2582.44	7.35012E+06	2711.11
TOTAL PROFIT AT 12 MNTHS	2029.31	1.20565E+07	3472.24

PARAMETER	VALUE
A	-552.011
B	.999563

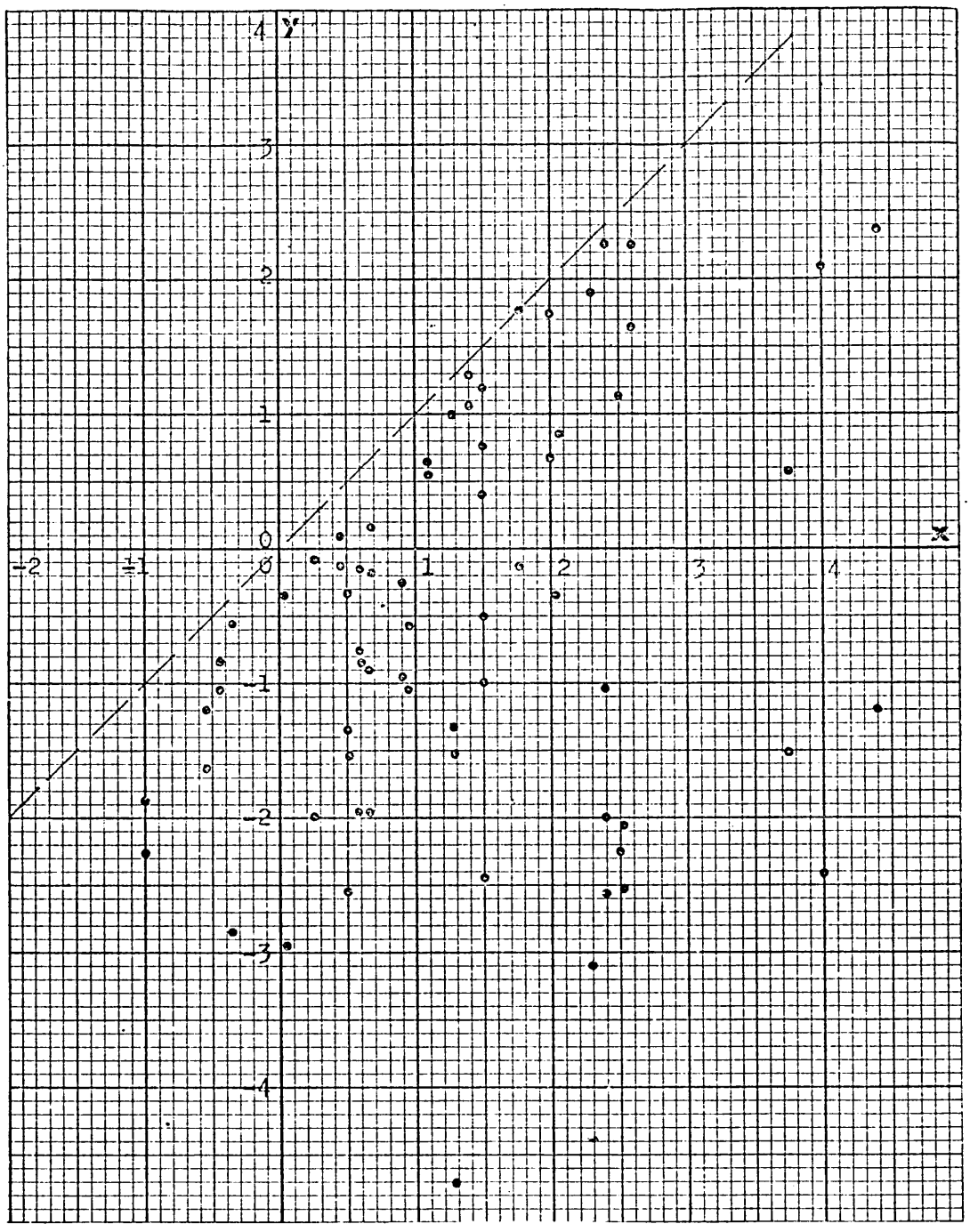
INDEX OF DETERMINATION	.60911
CORRELATION COEFFICIENT	.780455
F-RATIO TEST STATISTIC	52.9809



REGRESSION OF THE PROFIT ACCUMULATED AT THE END OF DECISION 8 AND THE PROFIT AT THE END OF DECISION 12 .



Graphical examination of the Range of Initial Profit and Loss obtained within Courses for the Initial Period of the B T A Exercise



X axis : The highest positive value within each course of the difference between the actual profit (cumulative) at month eight and the predicted (from the relevant B MS , A M S or Inter-Airline Regression Equations) profit for the same month based on a knowledge of the Initial Period profit .

Y axis : As above - but for the two remaining (therefore smaller profits) groups on each course .

Graphical examination of the Range of Change in Profit and loss through the B T A Exercise within Courses.

APPENDIX 7.14

ANALYSIS OF VARIANCE

Mean Profit of Loss obtained in the Initial Period

	SAMPLE	SAMPLE TOTAL	SAMPLE MEAN
I/A	1	2081	693.667
	2	1460	486.667
	3	1811	603.667
	4	1407	469
	5	733	244.333
	6	712	237.333
	7	1264	421.333
	8	1562	520.667
	9	1734	578
	10	-1822	-607.333
	11	995	331.667
	12	176	58.6667
BMS	13	628	209.333
	14	473	157.667
	15	1322	440.667
	16	810	270
	17	1945	648.333
	18	-139	-46.3333
	19	-292	-97.3333
	20	-32	-10.6667
AMS	21	2077	692.333
	22	92	30.6667
	23	2089	696.333
	24	1551	517
	25	1918	639.333
	26	271	90.3333
	27	347	115.667
	28	-1053	-351

	SAMPLE			
	I/A	BMS	AMS	TOTAL
Mean Square (Between Samples)	361324	199339	448888	304346
Mean Square (Within Samples)	377131	542601	384827	462321
Calculated value of F - Ratio	.95809	.36758	1.1665	.65830
Probability of F - Ratio as large as this occuring by chance alone are	0.507	high	0.374	

ANALYSIS OF VARIANCE

Mean Difference of Final Profit and Predicted Profit at Month 8

	SAMPLE	SAMPLE TOTAL	SAMPLE MEAN
I/A	1	-3300	-1100
	2	-415	-138.333
	3	-310	-103.333
	4	957	319
	5	-4945	-1648.33
	6	6461	2153.67
	7	-3394	-1131.33
	8	-2329	-776.333
	9	415	138.333
	10	-4912	-1637.33
	11	4402	1467.33
	12	3806	1268.67
BMS	13	1411	470.333
	14	-3462	-1154
	15	-2171	-723.667
	16	3419	1139.67
	17	-2249	-749.667
	18	-5178	-1726
	19	5612	1870.67
	20	2652	884
AMS	21	-1838	-612.667
	22	-3702	-1234
	23	2255	751.667
	24	-661	-220.333
	25	-1226	-408.667
	26	2553	851
	27	2803	934.333
	28	-176	-58.6667

	SAMPLE			
	I/A	BMS	AMS	TOTAL
Mean Square (Between Samples)	4.616E+6	4.800E+6	1.840E+6	3.875E+6
Mean Square (Within Samples)	2.136E+6	3.493E+6	2.980E+6	2.765E+6
Calculated value of F - Ratio	2.1606	1.3739	0.6155	1.4017
Probability of F - Ratio as large as this occuring by chance alone are	.056	.281	.737	

Final cumulative adjusted profit and itemised unit costs for all three teams during the BTA Exercise

ITEM		TEAMS		
		1	2	3
Cumulative Adjusted P/L		2157	7335	-3768
Cum. Shipping Charges		37.0	21.5	46.0
Storage costs	per Landing	0.019	0.040	0.015
	per Repair	0.504	0.983	0.397
Workshop Costs	per Landing	0.024	0.044	0.020
	per Repair	0.638	1.086	0.520
Wages :	per Repair	0.108	0.089	0.101
Premiums		-	125	233
Set - Up Charges		23.6	16.7	31.6

Sample de-briefing statistics used at the conclusion of the BTA Exercise . The example shown is from the SAB Course (Studies in Airline Business) January 1969 . All profit and cost figures are expressed in £ 000 s .

BMS (Junior Management) Population

Group	$Y_{actual} - Y_{calculated}$ from BMS Regression Eq.
16	-2260
17	1176
18	2495
22	-2598
23	-1371
24	507
25	-1968
26	-792
27	589
28	-136
29	1781
30	1774
52	918
53	651
54	-1982
55	-1894
56	-1016
57	-2268
58	4434
59	2395
60	-1217
85	2400
86	2255
87	-2003

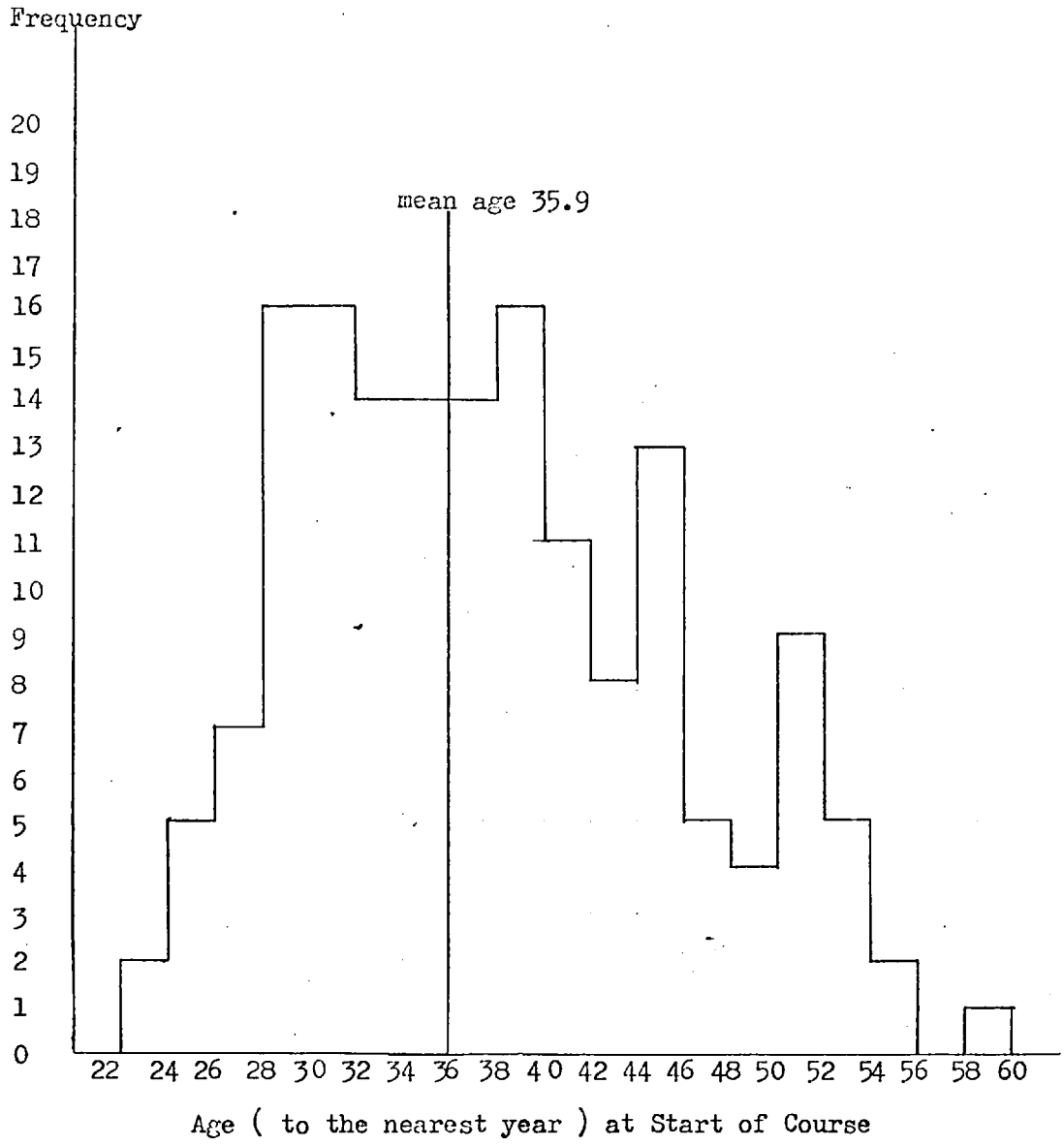
AMS (Middle Management) Population

Group	$Y_{actual} - Y_{calculated}$ from AMS Regression Eq.
7	-84
8	243
9	-1997
10	-562
11	-325
12	-2815
45	538
46	1091
47	626
49	-1019
50	942
51	-584
61	-2587
62	2367
63	-1006
64	-360
65	832
66	2081
73	-1528
74	3739
75	592
82	1499
83	775
84	-2450

Inter-Airline Population

Group	$Y_{actual} - Y_{calculated}$ from I/A Regression Eq.
1	-2972
2	14
3	-342
4	595
5	-853
6	-127
13	-958
14	903
15	-255
19	1284
20	1000
21	-1327
31	514
32	-318
33	2585
34	1637
35	2239
36	-1218
37	-1630
38	-546
39	-1053
40	-459
41	-837
42	437
43	-123
44	101
48	-1541
67	1292
68	-4701
69	-1503
79	684
80	2005
81	1713
88	1312
89	1432
90	1062

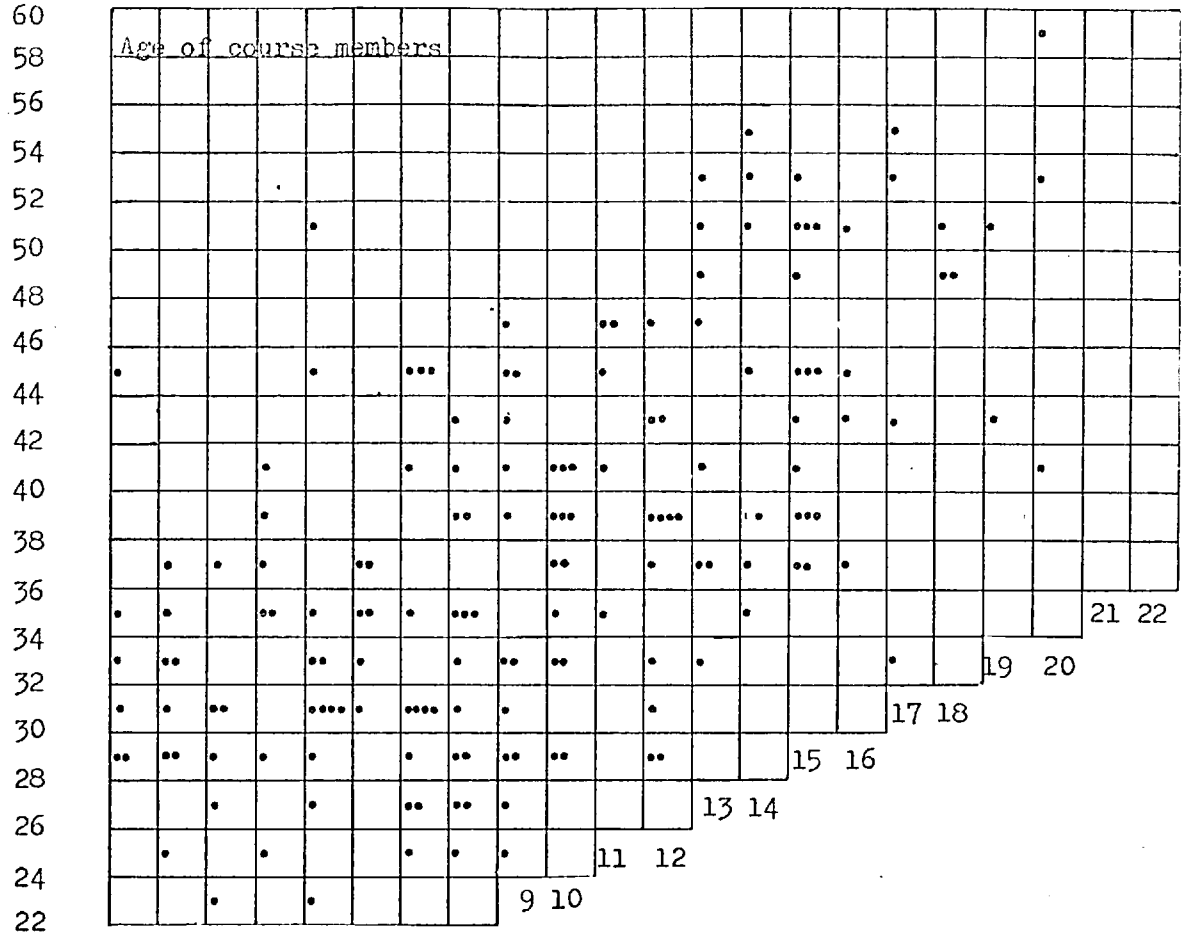
APPENDIX 8.1



Frequency Distribution of the Age of B M S and A M S Course Members

APPENDIX 8.2

AGE AND LENGTH OF BEA SERVICE



Length of Service (in years) of course members on the date of the course (only possible years - school leaving age taken into account).

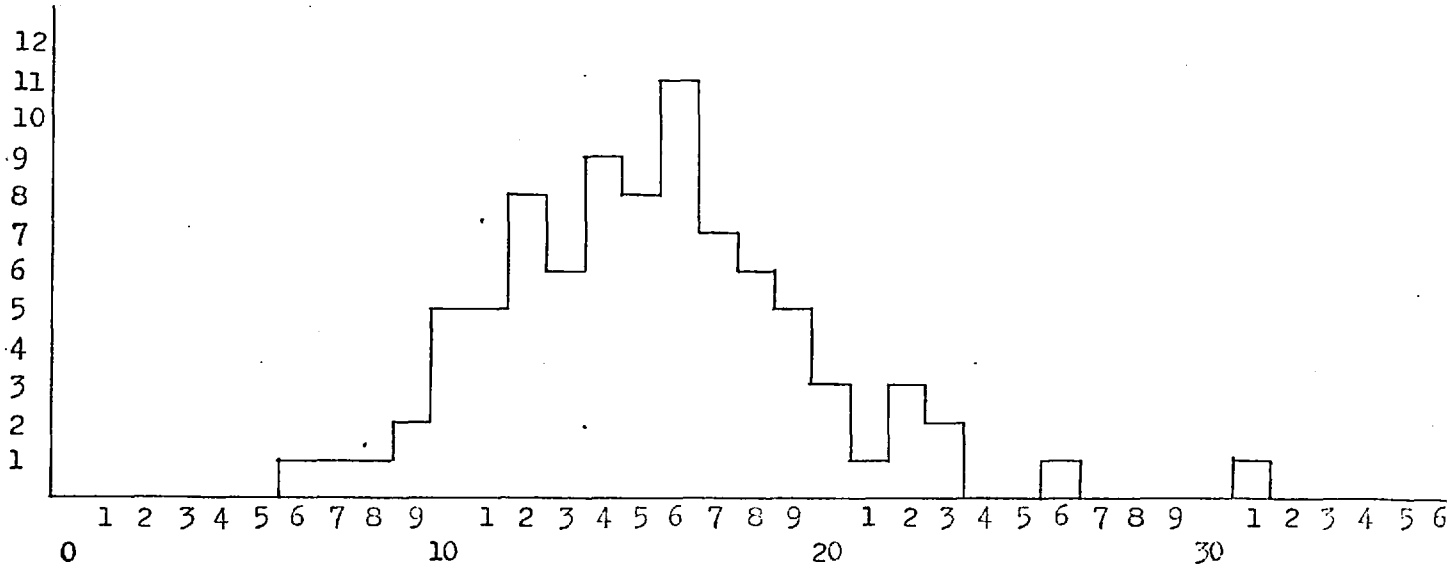
	Age	Length of Service	Pym I	Pym II	AH 5
Group 22	39	10	25	25	12
	33	17	26	24	10
	37	6	28	29	23
	28	3	25	25	19
	35	8	20	18	17
Group 23	33	9	21	19	12
	38	14	27	26	12
	25	8	14	17	13
	34	11	18	18	11
	32	10	26	26	19
Group 24	33	9	26	24	15
	37	15	20	19	16
	40	10	29	29	12
	28	1	20	20	31
	30	5	25	26	17
Group 25	37	13	25	23	14
	24	2	23	21	19
	38	14	25	27	14
	33	2	21	19	13
Group 26	36	14	12	14	12
	34	6	15	20	16
	36	6	21	21	13
	37	4	25	25	13
	51	15	18	19	12
Group 27	26	8	29	28	16
	28	12	25	21	16
	39	15	29	30	15
	34	8	22	19	12
	37	16	15	13	10

	Age	Length of Service	Pym I	Pym II	AH 5
Group 28	37	13	32	21	18
	44	1	25	33	18
	35	14	26	24	22
	42	15	18	17	6
	60	20	16	18	11
	51	16	25	23	9
Group 29	27	9	23	24	18
	23	5	25	25	13
	28	5	28	27	15
	45	15	21	20	18
	31	2	18	18	12
	41	9	21	17	12
Group 30	23	3	20	18	21
	29	1	28	30	14
	30	7	20	19	7
	37	15	14	16	11
	43	9	18	24	10
	40	15	15	15	9
Group 45	40	10	22		16
	31	5	26		16
	32	8	22		15
	29	4	22		17
	26	7	20		19
	43	19	20		10
Group 46	50	15	22		13
	28	7	23		18
	35	10	21		20
	30	2	28		22
	29	9	24		16
	31	5	22		26

	Age	Length of Service	Pym	All 5
Group 47				
	27	8	22	22
	32	5	29	17
	38	15	19	15
	55	17	21	16
	29	9	19	19
	34	4	24	13
Group 49				
	42	12	17	14
	38	8	21	20
	50	14	20	16
	32	6	27	16
	40	11	21	15
	40	8	25	17
	42	12	21	10
Group 50				
	30	5	26	16
	50	13	19	15
	28	8	27	23
	31	7	21	18
	33	10	23	17
	36	3	20	10
	30	7	22	14
	45	9	17	15
Group 51				
	39	12	19	14
	34	4	28	15
	36	2	19	14
	44	16	19	17
	48	18	21	8
	32	1	23	13
	31	6	29	15
	44	11	23	11

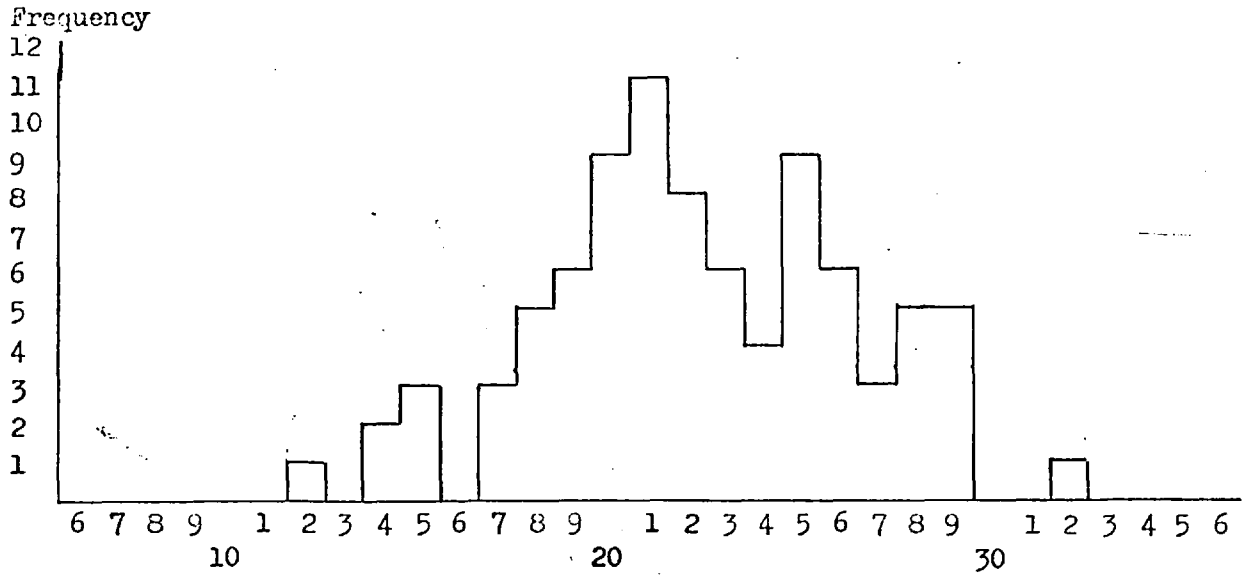
AH 5 AND PYM FLEXIBILITY SCORE *APPENDIX 8.4*

Frequency Distribution of A H 5 Scores



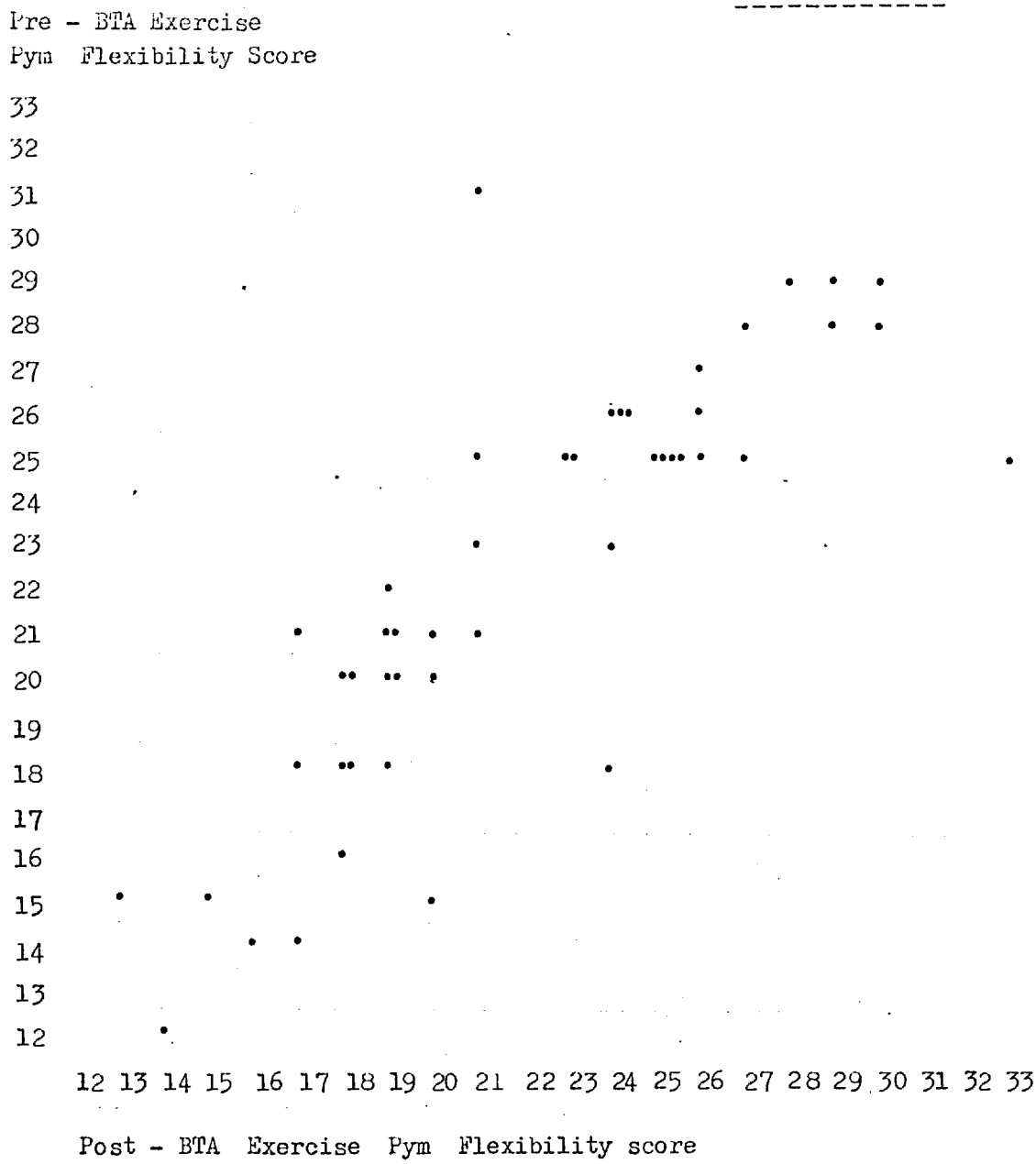
Score on AH 5 part I (minimum possible 0 - maximum possible 36)

Frequency Distribution of Pym Flexibility Measure



Score on Pym Flexibility Measure (minimum possible 6, maximum possible 36)

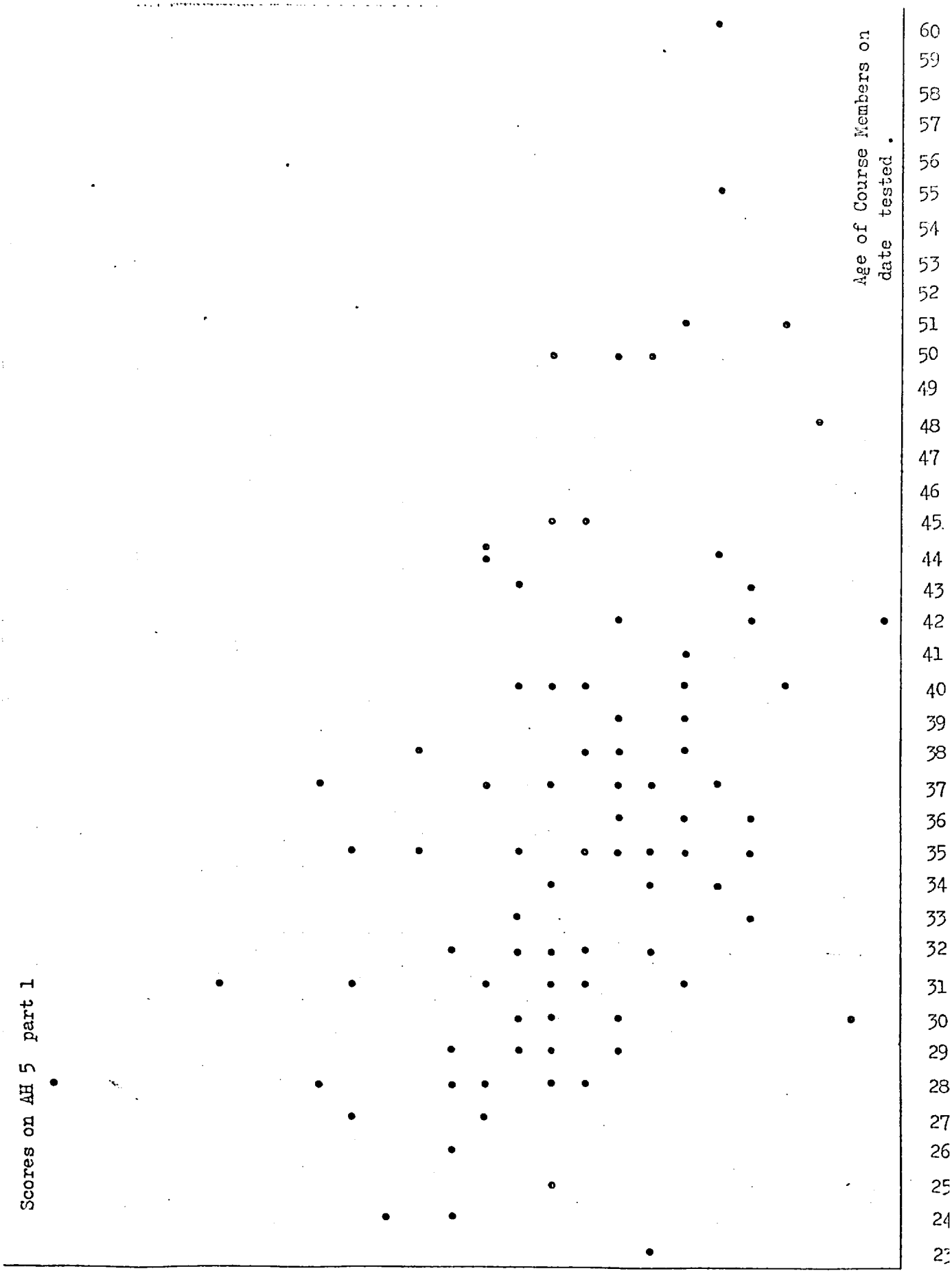
APPENDIX 8.5



Reliability of Pym measure of Flexibility

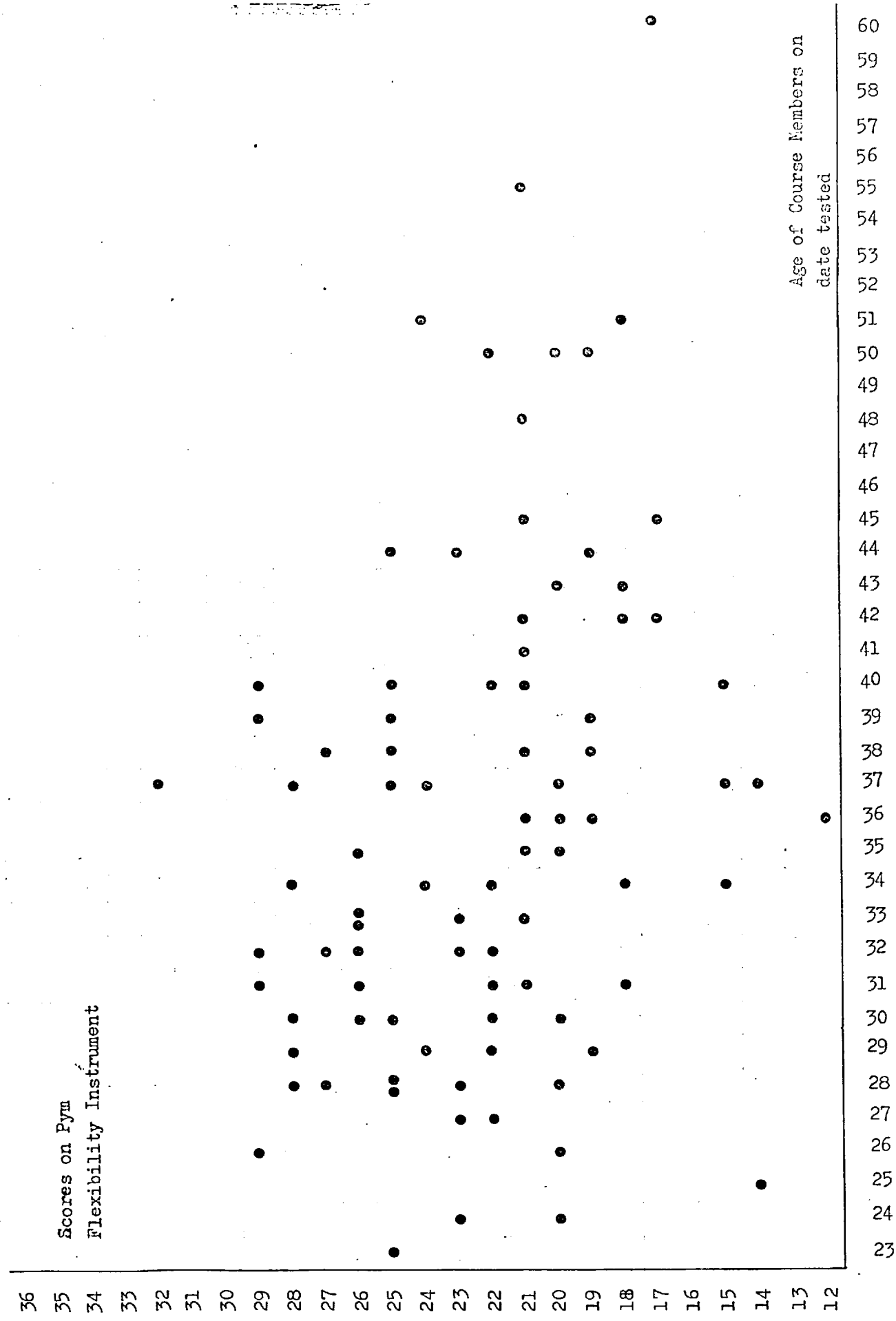
APPENDIX 8.6

CORRELATION AH5 AND AGE



APPENDIX 8.7

CORRELATION : PYM FLEXIBILITY MEASURE AND AGE .



AH 5 Means and Standard Deviations for B T A Exercise Groups

Group	mean score	standard deviation	
22	16.2	4.7	
23	13.4	2.9	
24	18.2	6.6	B M S Population
25	15.0	2.3	
26	13.2	1.5	Groups
27	13.8	2.4	
28	14.0	5.7	
29	14.7	2.6	
30	12.0	4.5	
45	15.5	2.7	
46	19.1	4.2	A M S Population
47	17.0	2.6	
49	15.4	2.8	Groups
50	16.0	3.5	
51	13.0	2.6	

Pym Flexibility Measure : Means and Standard Deviations for B T A Exercise Groups

Group	Mean Score	Standard Deviation	
22	24.8	2.64	
23	21.2	5.23	
24	24.0	3.52	B M S Population
25	23.5	1.66	
26	18.2	4.53	Groups
27	24.0	5.22	
28	23.7	5.32	
29	22.7	3.20	
30	19.2	4.87	
45	22.0	2.00	
46	23.3	2.28	A M S Population
47	22.3	3.44	
49	21.7	3.06	Groups
50	21.9	3.18	
51	22.6	3.74	

Sample data obtained from 2nd Test series : BMS 23 (groups 100 , 101 and 102)

Factor	100					101						102						
A	8	2	4	6	5	6	6	4	2	6	6	7	6	3	3	6	7	16 PF Sten Scores
B	10	10	10	8	8	6	9	6	9	8	8	9	9	10	9	9	9	
C	6	7	2	7	4	7	6	3	4	7	1	4	3	7	5	6	6	
E	4	5	6	7	3	5	5	5	7	6	4	3	2	7	8	4	7	
F	6	3	5	7	5	7	6	7	5	7	4	4	7	7	3	6	7	
G	4	4	4	4	6	2	5	4	5	4	5	6	5	4	5	2	2	
H	7	5	4	7	4	5	7	3	5	6	2	6	5	5	7	6	6	
I	1	3	7	1	1	2	2	3	9	5	3	7	4	3	6	6	6	
L	9	5	8	4	8	10	6	6	7	8	7	3	8	6	5	2	5	
M	4	4	6	6	3	4	3	6	7	8	6	9	6	4	6	7	8	
N	7	4	4	4	7	4	4	4	4	3	5	4	2	5	3	5	6	
O	6	4	6	2	7	4	2	8	10	5	6	6	8	4	5	6	8	
Q_1	6	8	8	5	7	4	10	7	8	6	6	6	8	6	7	5	8	
Q_2	5	6	9	7	6	5	2	5	9	8	7	5	9	3	6	5	5	
Q_3	8	7	5	7	7	9	5	6	6	8	5	6	7	7	6	4	4	
Q_4	9	3	8	3	7	4	3	10	10	6	9	5	6	4	7	7	8	
E	4	13	17	14	13	15	17	16	12	16	12	16	12	19		15	7	Connolly Actual Scores
F	12	5	9	8	7	19	10	14	3	14	19	10	10	14		16	16	
G	13	7	6	13	17	8	12	12	12	13	11	13	18	9		11	13	
H	10	8	17	15	9	11	16	11	20	20	13	18	7	4		14	23	
J	11	13	16	20	14	13	16	16	18	15	5	14	13	4		14	13	
K	20	18	4	2	8	8	1	2	7	3	17	1	4	12		6	3	
L	14	20	15	12	16	10	12	13	12	3	7	12	20	22		8	9	
E'	7	43	75	53	43	63	75	70	34	70	34	70	34	89		63	7	Connolly Per - centile
F'	37	6	17	13	9	82	24	52	6	52	82	24	24	53		67	67	
G'	76	20	13	76	94	28	68	68	68	76	58	76	94	36		58	76	
H'	16	7	68	48	12	20	58	20	90	90	53	76	7	7		40	94	
J'	17	30	57	88	38	30	57	57	75	48	9	38	38	9		38	30	
K'	94	94	33	13	66	66	5	13	56	23	94	5	33	86		47	23	
L'	88	93	85	71	90	56	71	76	71	6	31	71	93	93		39	48	

		16 PF			Connolly		
		B	Q_1	Q_2	F	G	K
	Member						
Group 52	1	7	7	7	17	84	94
	2	7	10	9	100	58	66
	3	10	8	7	13	47	23
	4	9	8	5	17	20	94
	5	8	6	5	30	100	66
	means	8.2	8.0	6.8	33.4	61.8	68.6
	standard devs.	1.0	1.6	2.1	14.4	9.2	11.6
Group 53	1	6	6	4	37	94	56
	2	6	10	5	37	84	71
	3	7	7	5	78	94	40
	4	10	8	10	37	36	56
	5	9	6	6	73	28	5
	means	7.6	7.4	6.0	52.4	67.2	45.0
	standard devs.	2.0	2.0	4.4	8.5	13.0	9.2
Group 54	1	6	8	5	82	100	86
	2	7	4	3	37	8	33
	3	8	10	7	87	47	56
	4	6	5	3	31	68	0
	5	5	5	7	44	94	47
	means	6.6	6.8	5.0	56.2	63.4	44.4
	standard devs.	1.0	4.6	4.1	10.5	15.0	12.6
Group 55	1	7	7	7	37	20	33
	2	8	6	5	87	100	64
	3	9	9	7	0	47	100
	4	8	6	6	31	94	90
	5	6	4	7	100	68	78
	means	7.6	6.4	6.4	51.0	65.8	73.0
	standard devs.	1.1	2.0	0.8	16.6	11.5	10.4
Group 56	1	8	8	6	92	76	13
	2	10	4	7	48	90	13
	3	9	7	5	37	68	78
	4	9	4	8	37	84	89
	5	9	4	8	92	58	5
	6	9	5	6	44	58	86
	7	10	9	10	60	13	47
	means	9.1	6.0	7.1	58.6	63.9	47.3
	standard devs.	0.5	4.0	2.1	8.4	8.9	13.0

		16 PF			Connolly		
		B	Q_1	Q_2	F	G	K
Group 57	1	9	7	6	78	100	33
	2	5	8	7	67	68	33
	3	7	7	7	37	47	71
	4	8	6	5	37	84	82
	5	5	7	8	82	28	78
	6	10	6	8	67	94	56
	7	7	5	8	24	36	78
mean		7.1	5.7	7.0	56.0	65.1	57.3
standard devs.		3.0	2.0	1.3	8.0	10.1	7.6
Group 59	1	6	4	5	82	28	66
	2	9	10	2	24	68	5
	3	6	7	5	52	68	13
	4	9	8	9	6	68	56
	5	8	6	8	52	76	23
	6	8	6	7	82	58	94
mean		7.6	6.9	6.0	49.7	61.0	42.9
standard devs.		2.0	3.5	5.4	11.4	6.4	13.0
Group 58	1	10	6	5	37	76	94
	2	10	8	6	6	20	94
	3	10	8	9	17	13	33
	4	8	5	7	13	76	13
	5	8	7	6	9	94	66
mean		9.2	6.8	6.6	16.4	55.8	60.0
standard devs.		1.0	1.4	2.0	4.9	14.7	14.6
Group 60	1	9	6	5	24	76	5
	2	9	8	9	24	94	33
	3	10	6	3	52	36	86
	4	9	7	6	-	-	-
	5	9	5	5	67	58	47
	6	9	8	5	67	76	23
means		9.2	6.6	6.6	46.8	68.0	38.8
standard devs.		0.1	1,2	3.3	7.2	7.8	12.2
Group 100	1	10	8	6	78	58	71
	2	9	4	5	-	-	-
	3	9	9	5	6	36	71
	4	5	8	4	60	36	94
	5	9	2	4	31	36	5
	6	8	6	7	17	68	86
	7	8	8	3	44	94	92
means		8.3	6.5	5.0	39.3	54.8	71.5
standard devs.		2.0	8.0	1.6	9.2	10.5	14.9

		16 PF			Connolly		
		B	Q_1	Q_2	F	G	K
Group 101	1	8	7	8	82	20	86
	2	9	7	7	52	76	23
	3	10	7	6	92	47	78
	4	7	8	6	78	84	40
	5	8	6	3	44	94	23
	6	8	10	8	37	94	94
	means	8.3	7.5	6.4	64.2	69.2	57.3
	standard devs.	1.0	2.0	2.7	10.2	11.7	12.1
Group 102	1	9	8	7	17	20	78
	2	8	6	4	17	8	58
	3	4	7	7	52	68	89
	4	5	6	10	37	94	92
	5	7	6	5	82	47	33
	6	7	10	5	37	94	94
	7	7	6	7	17	76	23
	8	7	7	7	13	36	92
	9	10	8	5	44	94	71
	means	7.1	7.1	6.3	35.1	59.7	68.8
	standards devs.	3.0	1.7	2.1	7.1	10.7	7.9

Group	mean age	standard deviation	
22	34.4	4.1	
23	32.4	4.6	
24	32.4	4.9	
25	33.0	6.7	
26	33.6	6.7	
27	32.8	7.7	
28	45.8	5.9	
29	35.0	8.2	B M S Course
30	33.7	6.9	
52	36.0	6.2	Populations
53	42.6	9.6	
54	36.0	7.8	
55	38.4	8.7	
56	40.6	7.0	
57	39.5	8.9	
58	39.2	7.7	
59	42.3	6.3	
60	41.0	6.2	
100	40.6	8.0	
101	35.1	7.1	
102	37.0	8.2	
45	33.5	6.0	
46	33.9	7.5	A M S Course
47	35.8	9.2	
49	40.6	4.9	Populations
50	35.6	7.4	
51	38.5	5.8	

		Age	Length of Service
Group 52			
	1	30	3
	2	30	12
	3	43	17
	4	44	9
	5	33	5
Group 53			
	1	25	9
	2	46	13
	3	53	17
	4	39	10
	5	50	19
Group 54			
	1	28	10
	2	27	5
	3	45	15
	4	45	7
	5	35	8
Group 55			
	1	35	1
	2	39	10
	3	52	15
	4	41	20
	5	25	4
Group 56			
	1	52	20
	2	38	15
	3	44	7
	4	47	9
	5	38	8
	6	38	4
	7	28	10
Group 57			
	1	31	9
	2	26	3
	3	50	15
	4	46	11
	5	35	5
	6	51	5
	7	38	12
Group 58			
	1	52	14
	2	40	4
	3	28	2
	4	36	12

		Age	Length of Service
Group 59			
	1	39	12
	2	46	12
	3	50	18
	4	44	7
	5	30	3
	6	45	15
Group 60			
	1	40	10
	2	47	11
	3	42	8
	4	30	8
	5	38	12
	6	49	13
Group 100			
	1	32	13
	2	35	6
	3	43	16
	4	48	18
	5	45	5
	6	29	2
	7	52	13
Group 101			
	1	36	9
	2	38	9
	3	31	7
	4	49	15
	5	30	12
	6	37	9
	7	25	7
Group 102			
	1	38	12
	2	34	7
	3	44	14
	4	28	9
	5	34	2
	6	55	14
	7	27	7
	8	41	13
	9	32	1

APPENDIX 9.1

		Month 1	Month 4	Month 7	Month 10
VERY BUSY	(8)	87.5	12.7	5.2	
	(12)	86.3	11.4	6.0	4.0
BUSY	(8)	10.5	52.3	48.7	
	(12)	13.7	54.0	48.0	28.0
QUITE BUSY	(8)	2.0	33.8	40.3	
	(12)		29.9	42.0	50.0
NOT VERY BUSY	(8)		1.2	5.7	
	(12)		4.6	4.0	16.0
IDLE	(8)				
	(12)				2.0

Response to Question 3. Inter - Decision Period Questionnaire

" How busy in general have you been during the last decision period ? "

All figures are per cent. Sample size N varies from 71 to 73 for 8 month groups to 49 - 51 for 12 month groups .

		Month 1	Month 4	Month 7	Month 10
YES	(8)	52.5	70.0	70.0	
	(12)	48.2	64.4	68.0	56.0
NO	(8)	5.2	1.2	3.7	
	(12)	4.0	4.0	6.0	10.0
IN-BETWEEN	(8)	42.3	28.8	26.3	
	(12)	47.8	31.6	26.0	34.0

Response to Question 4 Inter - Decision Period Questionnaire *APPENDIX 9.2*

" Have you been quite sure what the other members of the syndicate expected of you during the last decision period ? "

		Month 1	Month 4	Month 7	Month 10
Frequent Occasions	(8)			3.7	
	(12)	2.0			6.0
Some Occasions	(8)	4.0	1.2	3.7	
	(12)	6.8	4.0	6.0	12.0
Few Occasions	(8)	8.5	28.8	26.3	
	(12)	13.7	29.9	32.0	52.0
No Occasions	(8)	87.5	70.0	66.3	
	(12)	77.4	66.1	62.0	30.0

Response to Question 5 Inter - Decision Period Questionnaire *APPENDIX 9.3*

" Have there been any periods during this last decision period which were not conducive to good decision-making ? For example , feuding between group members ? "

		Month 1	Month 4	Month 7	Month 10
1st Quarter	(8)	15.0	18.3	20.7	
	(12)	16.2	20.1	22.3	26.2
2nd Quarter	(8)	24.0	23.8	24.0	
	(12)	22.3	22.7	22.5	25.6
3rd Quarter	(8)	28.2	27.8	26.3	
	(12)	27.5	27.3	25.3	25.0
4th Quarter	(8)	32.8	31.0	28.8	
	(12)	34.0	29.8	29.9	23.2

Response to Question 6 Inter - Decision Period Questionnaire

" How has your work been distributed in effort between receiving the simulation print - outs of results from the previous decision and handing in the completed decision forms for this last decision ? "

" Give the percentages of total work done by you in each of four hypothetical equal (in time) quarters . For example , 0 % , 20 % , 40 % , and 40 % . "

The figures represent the mean of the percentages entered by individuals for the two populations in the four quarters .

		Month 1	Month 4	Month 7	Month 10
NATURE OF THE TASKS YOU WERE DOING ?	YES (8)	63.2	44.7	26.7	
	NO		8.6	14.3	
	YES (12)	67.4	49.8	22.0	20.4
	NO	1.2	4.0	10.0	10.2
DEPENDENCE ON THE WORK OF OTHER PEOPLE ?	YES (8)	69.0	57.6	46.7	
	NO		4.3	14.3	
	YES (12)	74.2	63.2	48.0	44.0
	NO	2.4		8.0	8.0
YOUR OWN CHOICE OF EFFORT ?	YES (8)		4.3	13.0	
	NO	63.2	36.6	26.7	
	YES (12)			8.0	12.2
	NO	57.5	49.8	32.0	20.4
OTHER REASONS ?	YES (8)	3.6	4.3	7.0	
	No	28.2	36.6	34.3	
	YES (12)			4.0	
		22.4	34.6	32.0	28.4

Response to Question 7 Inter - Decision Period Questionnaire

" Do you consider this distribution (that identified in the answer to question 6) to be due to :

The nature of the tasks you were doing

Dependence on other people's work

Your own choice of effort

or Other reasons ? "

Task Performed		Month 1	Month 4	Month 7	Month 10
1st Quarter	A	29.8	27.3	27.8	27.7
	B	10.2	22.2	21.6	23.8
2nd Quarter	A	28.6	27.9	28.2	28.9
	B	22.3	27.7	25.2	26.4
3rd Quarter	A	24.0	24.1	25.4	25.4
	B	32.5	27.8	26.5	25.6
4th Quarter	A	17.4*	21.6	18.6	18.0
	B	35.1	23.2	26.6	24.1

Response to Question 6 Inter - Decision Period Questionnaire : only replies from group members concerned with the following tasks (separately) have been included .

A members : deciding the basic frequency pattern of aircraft .

B members : deciding spare part shipment to various stations .

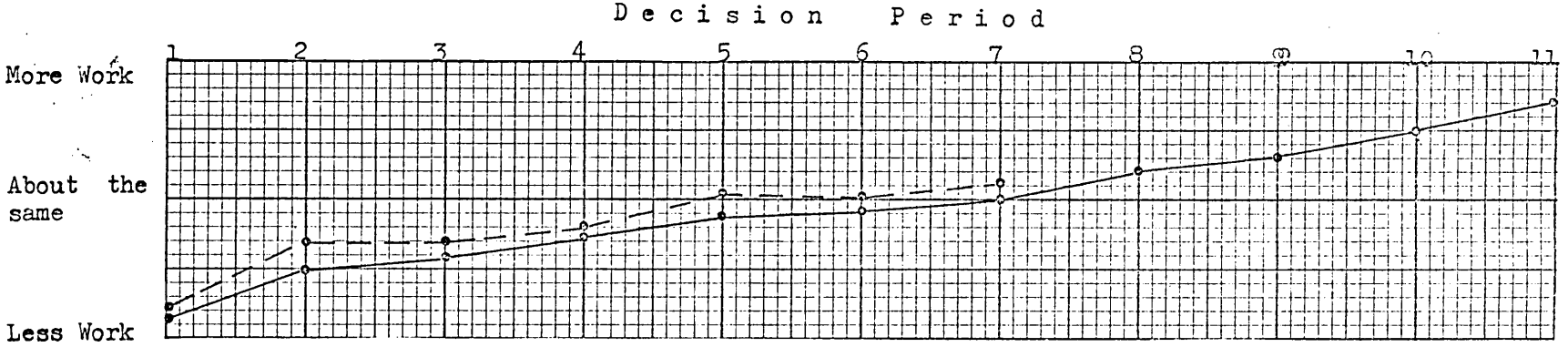
NB . All these members were concerned with other activities as well as those listed above . These two activities were always mutually exclusive . Only one member has been selected for each activity from the groups .

A t test carried out the samples of % entries from the two populations (whose means are given above) indicated - for the month/quarters designated with * - a statistical significance of only 0.01 that the difference could have occured by chance alone .

		Month 1	Month 4	Month 7	Month 10
Complete	(8)		4.3	14.3	
	(12)			10.0	28.0
Good	(8)		12.9	34.3	
	(12)	2.4	20.1	39.9	42.0
Adequate	(8)	10.5	52.3	40.3	
	(12)	13.7	66.1	32.0	28.0
Fair	(8)	63.2	31.6	11.0	
	(12)	67.4	9.8	14.1	2.0
Poor	(8)	26.0			
	(12)	16.5	4.0	4.0	

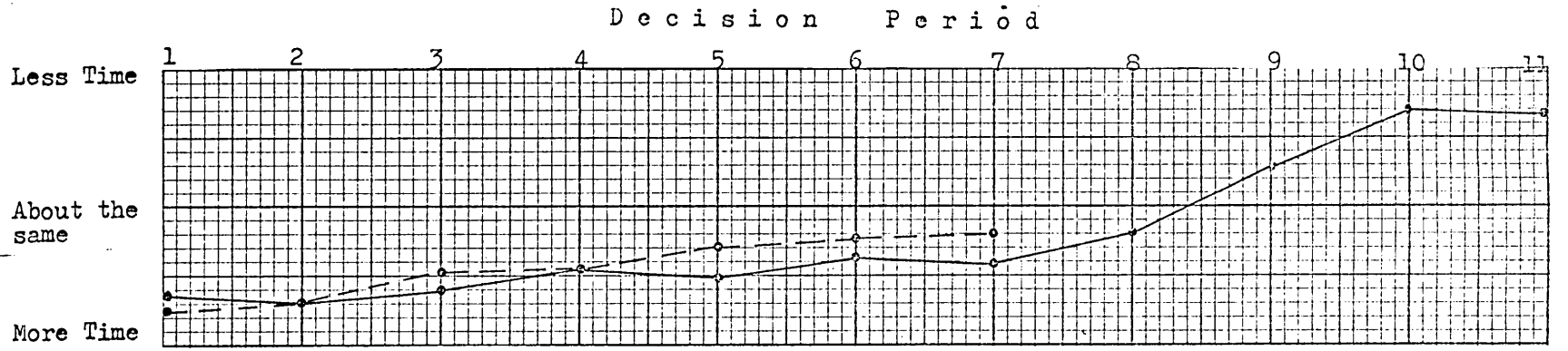
Response to Question 8 Inter - Decision Period Questionnaire

" What is the extent of your knowledge of the details of the particular activities with which you have been concerned during the last decision period ? Include in this , activities done in conjunction with other group members as well as those which you alone are responsible for . "



Response to Question 9 Inter - Decision Period Questionnaire

" Would you like to be doing ..... ? "



Response to Question 10 Inter - Decision Period Questionnaire

" Would you like to spend . . . . . doing the activities you did in the last decision period ? "

		Month 1	Month 4	Month 7	Month 10
Complete	(8)			5.2	
	(12)			4.0	8.0
Good	(8)		1.2	10.2	
	(12)			8.0	8.0
Adequate	(8)	2.4	18.3	52.6	
	(12)	4.0	22.4	62.0	70.0
Fair	(8)	25.5	51.7	20.3	
	(12)	27.4	55.2	16.0	10.0
Poor	(8)	72.1	28.8	11.7	
	(12)	68.6	22.4	10.0	4.0

Response to Question 11 Inter - Decision Period Questionnaire

" What is the extent of your knowledge about the total range of activities being undertaken by your partners in the group ? "

		Month 1	Month 4	Month 7	Month 10
2 or 3 more People ?	(8)	15.0	1.2		
	(12)	22.3	4.0	2.0	
1 more Person ?	(8)	70.0	53.4	26.3	
	(12)	68.0	52.0	24.0	4.0
The same as at present ?	(8)	15.0	44.0	62.2	
	(12)	9.7	44.0	62.0	80.0
1 less Person ?			1.2	11.4	
				12.0	14.0
2 or 3 less People ?					
					2.0

Response to Question 12 Inter - Decision Period Questionnaire

" At this stage in the Air Line Simulation how do you feel about the number of people in your group ?
Do you think you (as a group) would be more effective if you had ..... ? "

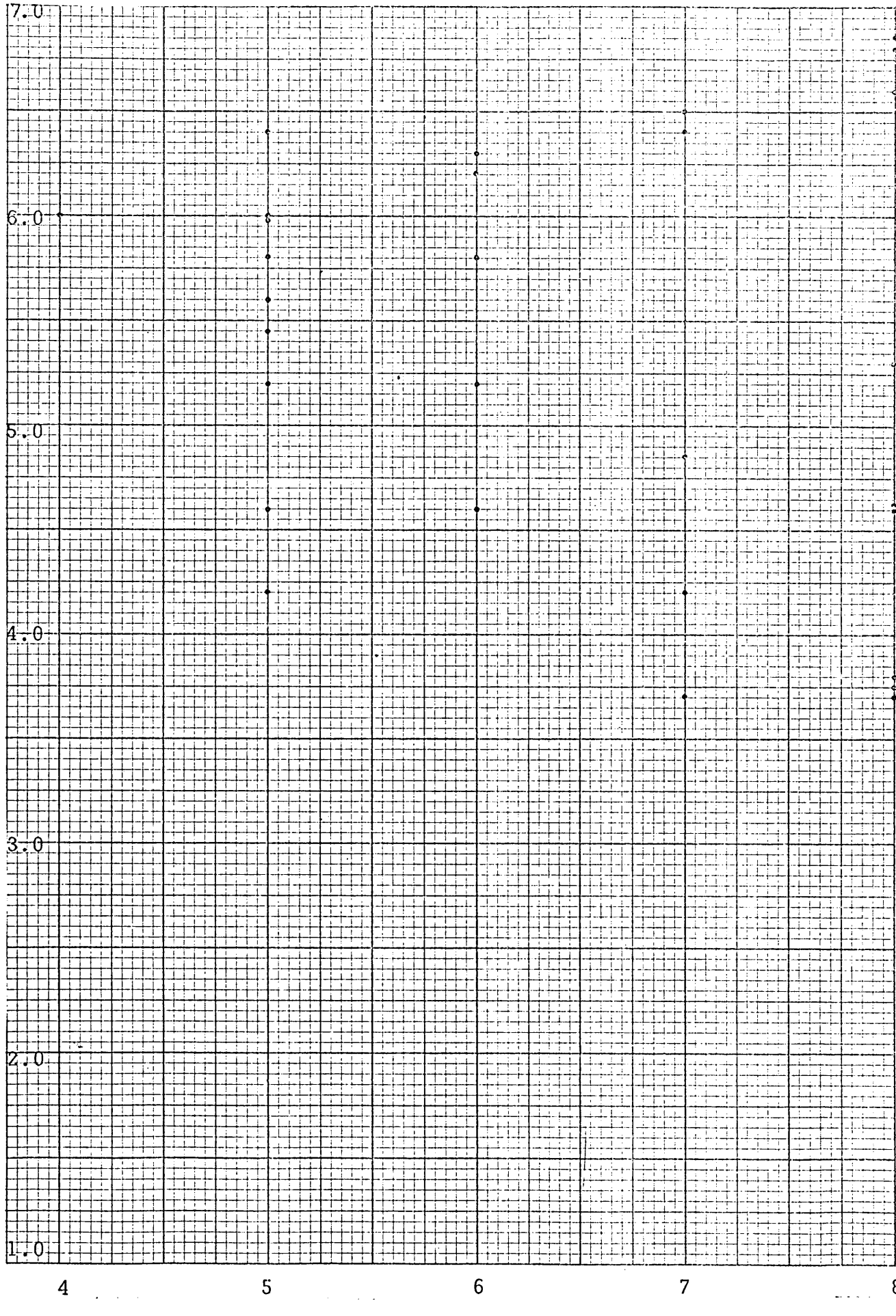
	Month 1	Month 4	Month 7	Month 10
Excellent	2.4	2.4	6.9	
	2.0	6.0	12.0	10.0
Good	44.8	52.3	70.0	
	54.0	54.0	60.0	46.0
Middling	42.1	37.2	20.7	
	34.0	40.0	22.0	32.0
Only Fair	10.5	2.4	2.4	
	10.0		6.0	8.0
Poor				
				4.0

Response to Question 13 Inter - Decision Period Questionnaire

" The general " morale " of your syndicate at this stage in the exercise is ..... ? ".

Examination of the Relationship between Group Size and the Mean number of Tasks carried out by the members of that group .

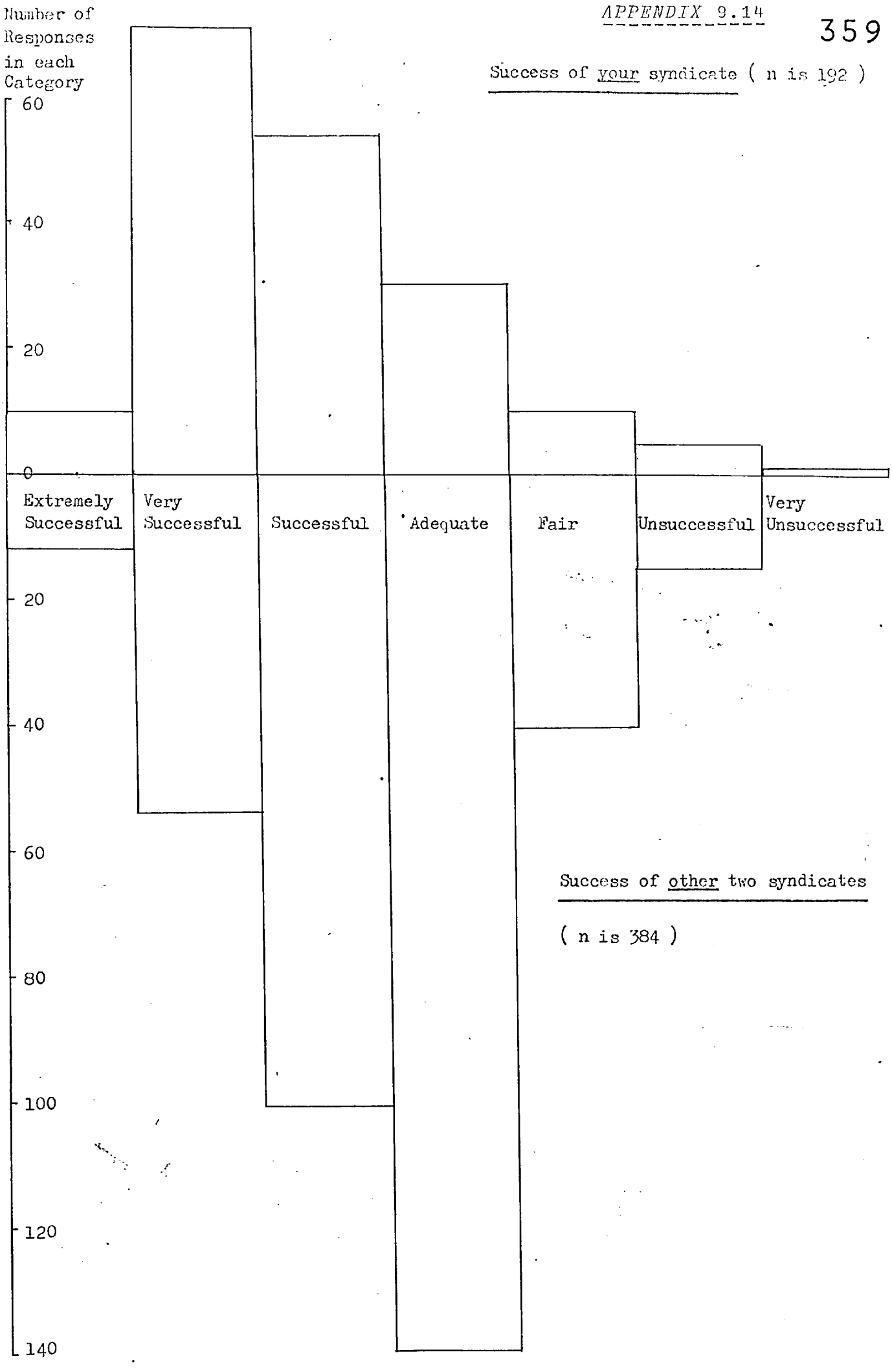
Mean number of Tasks carried out by each group member



APPENDIX 9.13

Cumulative mean decision - making categories chosen for all fifteen listed tasks for all groups : arranged according to group size.

	1	2	3	4	5	6	7
4 Membered Groups							
25	10		4				1
5 Membered Groups							
55		3	8	2	2		
53	6	2	3	2	2		
54	3	6	6				
52	9	3	2	1			
22	2	6	5	1			1
26	4	4	7				
24	5	4	3	1	2		
27	7	5	2	1			
58	3	7	5				
6 Membered Groups							
29	7		7	1			
30	3	6	4	2			
28	2	6	7				
23	8	2	3	2			
57	1	4	9	1			
59	2	6	5	1			
7 Membered Groups							
56		6	6	3			
64	7	4	1	1	2		
34	4	3	5		3		
100	7	2	6				
101	11		3	1			
8 Membered Groups							
50	2	4	5	4			
51	9		6				
31	7	7		1			
35	7	1	2	2	3		
32	7	5	3				
33	5	7	2	1			
48				4	11		
102	4		9		2		



Comparitive analysis of the responses to questions 6 and 7 : Post BTA Questionnaire.

Response to Question 6 Post BTA Questionnaire

APPENDIX 9.15

How successful do you think your syndicate has been ?

	-1.4	-1.0	-0.6	-0.2	0.2	0.6	1.0	1.4
Extremely Successful				2		6	2	
Very Successful		4	6	20	12	28	2	
Successful		3	7	18	12	13	1	
Adequate	3	12	8	3	4			
Fair	6	4						
Unsuccessful	2	3						
Very Unsuccessful	1							

Initial Profit / Loss on Trial Decision (in £ 000,000s.

Response to Question 7 Post BTA Questionnaire

APPENDIX 9.16

How successful do you think the other two groups in your course have been ?

	-1.4	-1.0	-0.6	-0.2	0.2	0.6	1.0	1.4
Extremely Successful				2		8	2	
Very Successful			2	6	10	30	6	
Successful			8	30	25	36	2	
Adequate	12	29	24	40	21	20		
Fair	8	20	4	8				
Unsuccessful	4	7	4					
Very Unsuccessful								

Initial Profit / Loss on Trial Decision (in £ 000.000s)

	Percentage Replying	Y E S	N O
Good members in your particular syndicate ?	5 4 . 3	8 3	1 7
Good allocation of activities and responsibilities ?	6 5 . 8	1 1 0	1 1
Actions of your Chairman ?	4 7 . 3	2 0	6 7
Good co-ordination of various tasks ?	6 5 . 8	1 1 8	3
Other reasons ?	2 1 . 7	1 1	2 9

Response to Question 8 Post BTA Questionnaire (N , 184)

" What do you think was the reason for your financial success ? Indicate Y E S or N O - or leave blank if you are unable to judge-against each of the following ..... "

APPENDIX 9.18

	Percentage Replying	Y E S	N O
Capabilities of your syndicate's members ?	8 0 . 0	4 8	9 9
Poor allocation of activities and responsibilities ?	7 0 . 5	5 8	7 2
Actions of your Chairman ?	5 0 . 0	6 2	3 0
Little co-ordination ?	4 3 . 5	5 1	2 9
Other reasons	3 1 . 9	2 1	4 1

Response to Question 9 Post BTA Questionnaire (N , 184)

" What contributed to your syndicate not doing as well as it might have done ..... "

Grouped response from particular individuals for questions 8 and 9 in the Post BTA questionnaire according to selection of factors .

Reason 1 : Capabilities of the members of your particular syndicate ?

A Factor effecting Success ?	A Factor effecting lack of success ?		
	YES	NO	NO REPLY
NO REPLY	26	23	35
NO	22	16	1
YES	22	60	1

Reason 2 : Allocation of Tasks and Responsibilities in the Group ?

A Factor effecting Success ?	A Factor effecting lack of success ?		
	YES	NO	NO REPLY
NO REPLY	11	10	40
NO	47	10	1
YES	47	52	11

Reason 3 : Actions of your Chairman

A Factor effecting Success ?	YES	NO	NO REPLY
NO REPLY	21	5	71
NO	37	11	19
YES	4	14	2

A Factor effecting lack of success

Reason 4 : Co-ordination of various tasks ?

A Factor effecting Success ?	YES	NO	NO REPLY
NO REPLY	1	2	60
NO		3	
YES	50	24	44

Summary Data obtained from the completed Post BTA Exercise (Questions 4 and 5) from the individuals making up specific groups relating to the Task and Decision - Making Structure of each group .

The example shown overleaf is syndicate one of the Basic Management Studies course 21 , which has been designated in this research group 55 . Similar summaries were prepared from the collated questionnaires from all the 29 groups in this part of the research study .

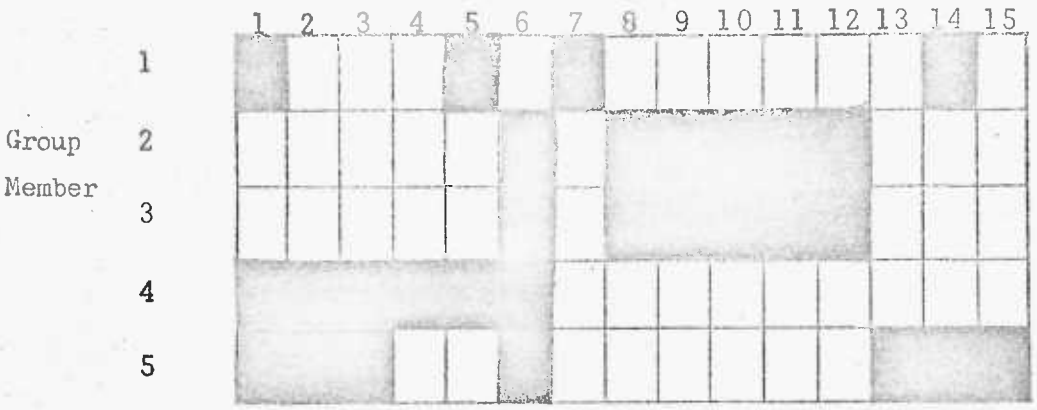
The first tabular display represents the tasks undertaken by each individual in the group . The number of group members in this example is 5 and the number of tasks is the standard number of 15 adopted categories . Each line represents the entry made by that individual himself in the total analysis of structure that he made in response to question 4 . The entries each person made about the tasks that other people were performing were only used in the construction of the second table .

In this table a " block " has only been entered when all four other people in the group agree with each other which tasks the fifth person has been carrying out . When there is no complete agreement the degree of partial agreement is written in.

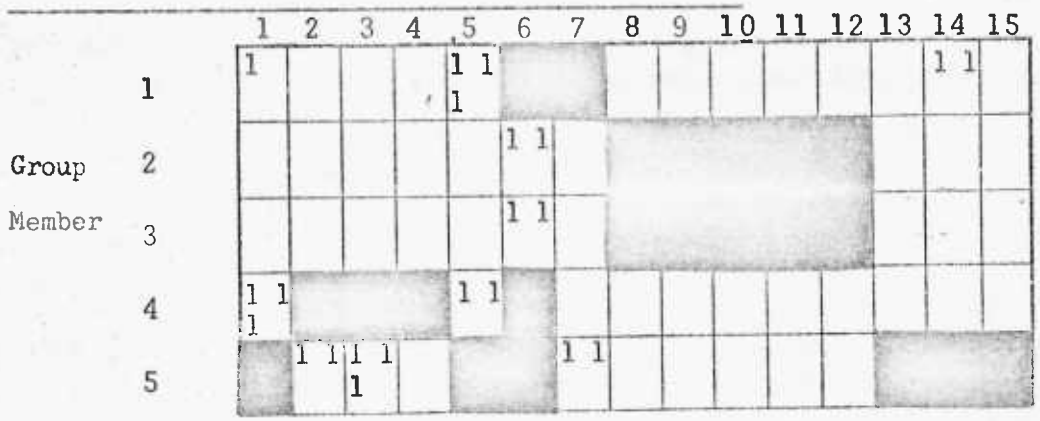
The summary at the foot of the page identifies the separate and total response to question 5 concerned with the type of decision-making existent with each of the designated 15 Task categories . The figures entered in the four columns indicate the group number of the person who is represented by the entry . The totals give the separate number of the four decision - making categories identified for the whole group over all the tasks .

Team XXI 1 Group No. 5 5

Perceptions of own Tasks



Perceptions of the Tasks of others in the group



Decision - Making Categories

Task Categories	A	B	C	D
1		1 3 4	2 5	
2		1 2 3 4 5		
3		1 2 3 4 5		
4		1 2 3 4 5		
5		2 3 4 5	1	
6	2	4	1 3 5	
7	1 5	2	3 4	
8	2 4	1 3 5		
9	2 4	1 3 5		
10	2 4	1 3 5		
11	4	2 3	1 5	
12	2	1 3 4 5		
13		1	2 3 4 5	
14	1 5	2 3	4	
15			1 2 3 4 5	
Totals	13	42	20	0

APPENDIX 9.21

Differences between members records of task pattern identification in the Post BTA Exercise Questionnaire .

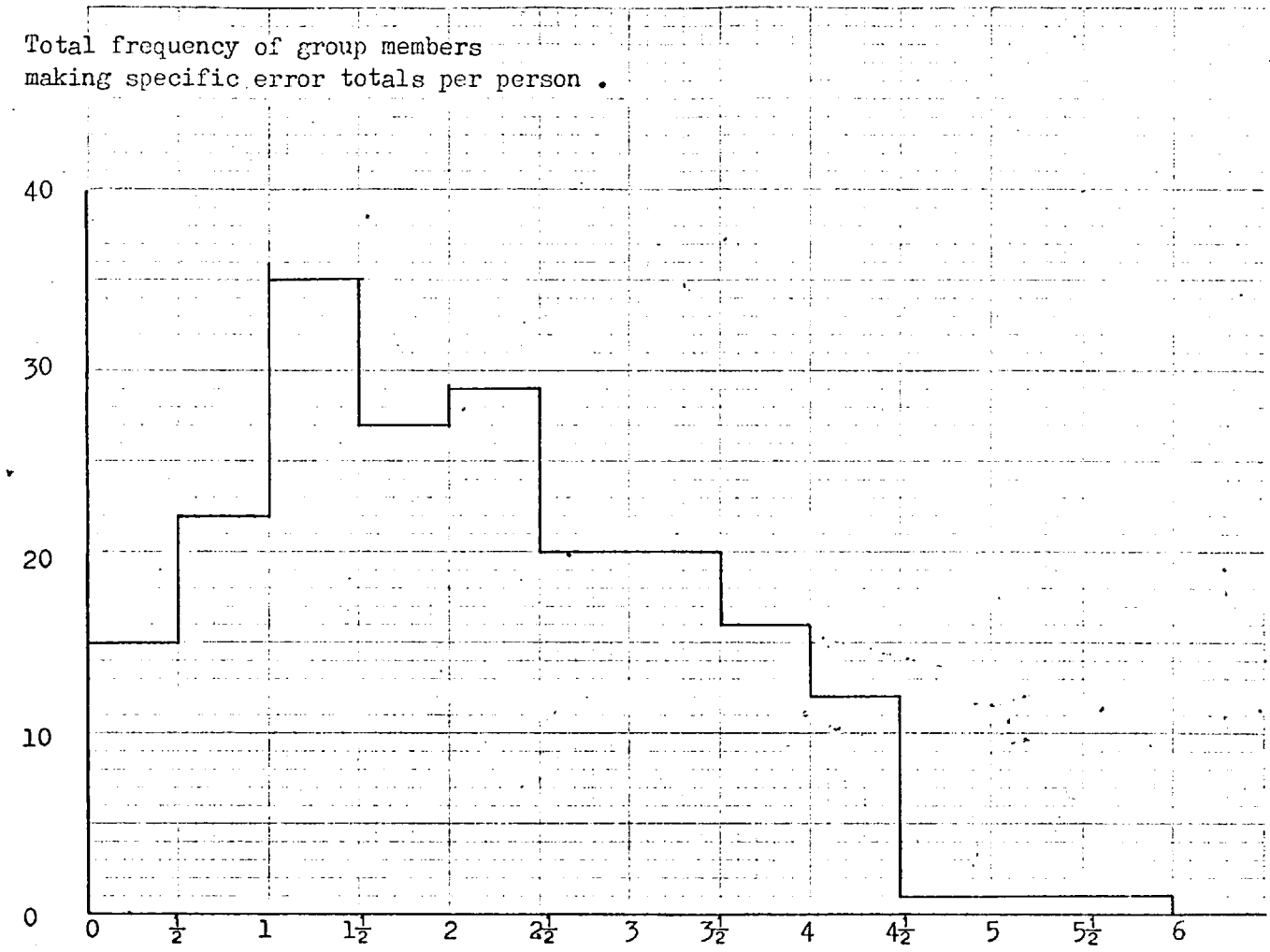
An extensive analysis of the errors associated with each groups and group members identification of task allocation was carried out . For each individual the actual number of errors was calculated and a standard group measure of error - the number of task errors made per member of the group - was derived . Table 1 shows the total numbers of errors for each group member arranged according to the size of the group . The mean number of mistakes associated with the different sized groups does increase a little over the range 4 to 8 group members . But this is not statistically significant . The great majority of variance in the response leading to errors is independent of the size of origin . The increase in the total number of errors is that which can be predicted from the parallel increase in the number of other members in the group for whom structural task descriptions have to be made . A histogram of the frequency of the combined populations (standardised to the number of errors made in entering the task description of a single other person in the group) suggests a more detailed analysis of the error results .

The second set of tables included in this appendix gives , for each collection of groups with the same number of members , the errors associated with each member . The groups have been arranged in increasing totals of group errors for each table . The charts indicate that the number of errors found in the structural description response made by members of a group are definitely inter-related and different from the mean respone of some other groups in the same table . This indicates that the ability of a group member to find out and describe the task structure of his group is dependent on a factor which has a common effect on all the members of his group .

APPENDIX 9.21 TABLE 1

Number of mistakes	4 Person Groups	5 Person Groups	6 Person Groups	7 Person Groups	8 Person Groups
0					
1		1	2	1	1
2		2		7	2
3		3	2	2	1
4		5		4	3
5		1	4	2	1
6	1	1	4	5	3
7		3	4	3	2
8	2.	6	2	2	6
9		3	2	1	3
10	1	1	1	2	2
11		1	3	1	2
12		2	2	1	3
13		1		2	1
14		3	2		4
15		4	3	2	1
16		2	1	1	2
17		1	3	2	1
18			1	1	2
19					1
20					1
21				5	4
22				1	1
23					4
24				3	3
25					2
26				1	
27					
28					2
29					3
30					
31					
32					1
33					
34					
35					1
36					
37					
38					
39					1

Total number of unit mistakes made by individuals in their perceptions of the tasks carried out by other members of the group classified against the size of the group.



No of unit errors made in identifying the tasks performed by other members of the group (standardised to average error per single person)

Frequency of the numbers of errors made by individuals in groups when assessing the tasks carried out by other members of the group (standardised to number of errors made per. person).

5 Person Groups

Group No.	Numbers of errors in the identification of structure																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
55	1			2		1		1									
22		1		1			2	1									
54			1	1	1			1	1								
52			1	1			1	1		1							
26		1	1					2	1								
53									2			1	1	1			
24												1		1	1	1	1
58														1	3	1	

6 Person Groups

Group No.	Numbers of errors in the identification of structure																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
23	2				1	2	1											
30			1		1	1	2			1								
29							1		1		1	1		1		1		
28									1		1	1			2		1	
59											1			1	1		2	1

Examination of the variation of errors (number of) within groups in the identification of the specific tasks carried out by members of the group

Figures within the table give the number of group members who have been associated with numbers of errors . The error total is the additive figure that all group members have made about the tasks being carried out by each single individual in the Post BTA Questionnaire .

7 Member Groups

Numbers of errors

Group No.	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	32	33	34	35	36	37	38
101	1		1	2		2		1																														
57		3		1		1	1			1																												
56		1		1			2		1		1	1																										
34		2			1	1		1					2																									
100		1	1		1					1					2	1																						
64																					3			3		1												

8 Member Groups

Numbers of errors

Group No.	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	32	33	34	35	36	37	38	39
59		1			1		2	2		1				1																									
32			1	1		1		2			2		1																										
102		1		1		1			3						1			1																					
31	1			1		1		1				1		2						1																			
51								1		1		1					1			1	1	1		1															
33												1				1	1		1			1	1						1		1							
35														1		1		1	2			1	1									1						
48																						1	1	1		2	2										1

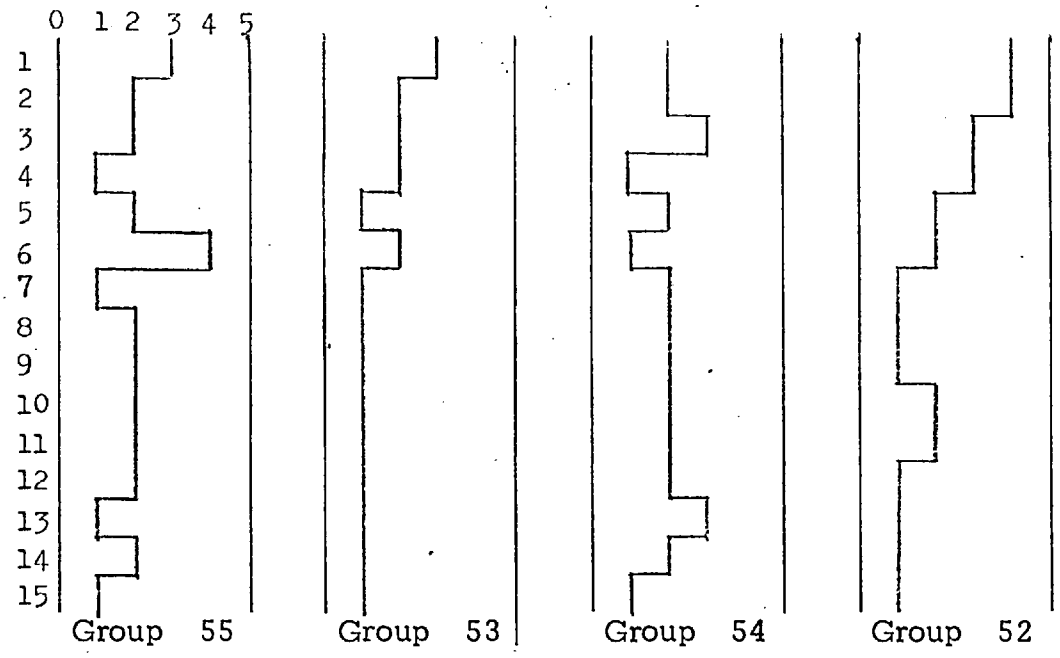
Numbers of People carrying out each of the 15 tasks identified in the BTA Exercise.

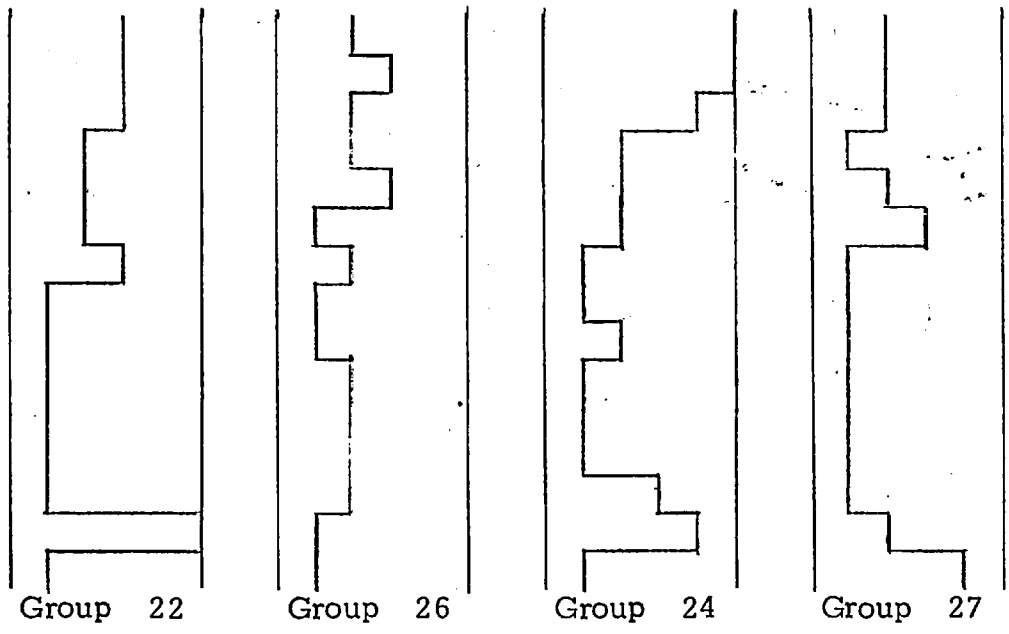
In the following four pages the groups who completed the Post BTA Exercise Questionnaire have been arranged according to the total number of group members in each group .

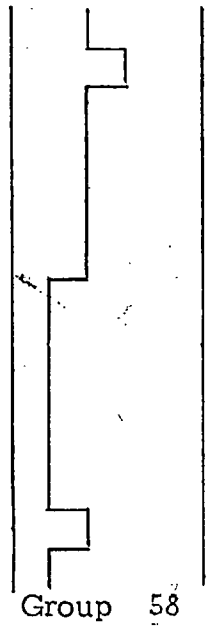
The horizontal scale (from 0 to the total number in each group) indicates the number of people who have been identified as being concerned with the specific task .

The vertical scale (from 1 to 15) indicates the task category code number , which represent the following required tasks in the exercise : -

1 Evaluating Seat Configurations possible .
2 Consideration of Jet / Prop. Allocations to Routes .
3 Calculating frequencies for the Routes .
4 Consideration of Checks and Modifications .
5 Estimation of Market Potential .
6 Calculating Cost and Revenue Figures .
7 Calculating Market , Station Expenses etc .
8 Calculating M U failures at Stations .
9 Calculating Shipments to Stations .
10 Calculating M U and Component needs at Base .
11 Calculate Purchase Order .
12 Calculate number of required Workshop Staff .
13 Evaluate Personnel Wastage Problem .
14 Evaluate R and D Problem .
15 Co - ordination of Syndicate Activity .

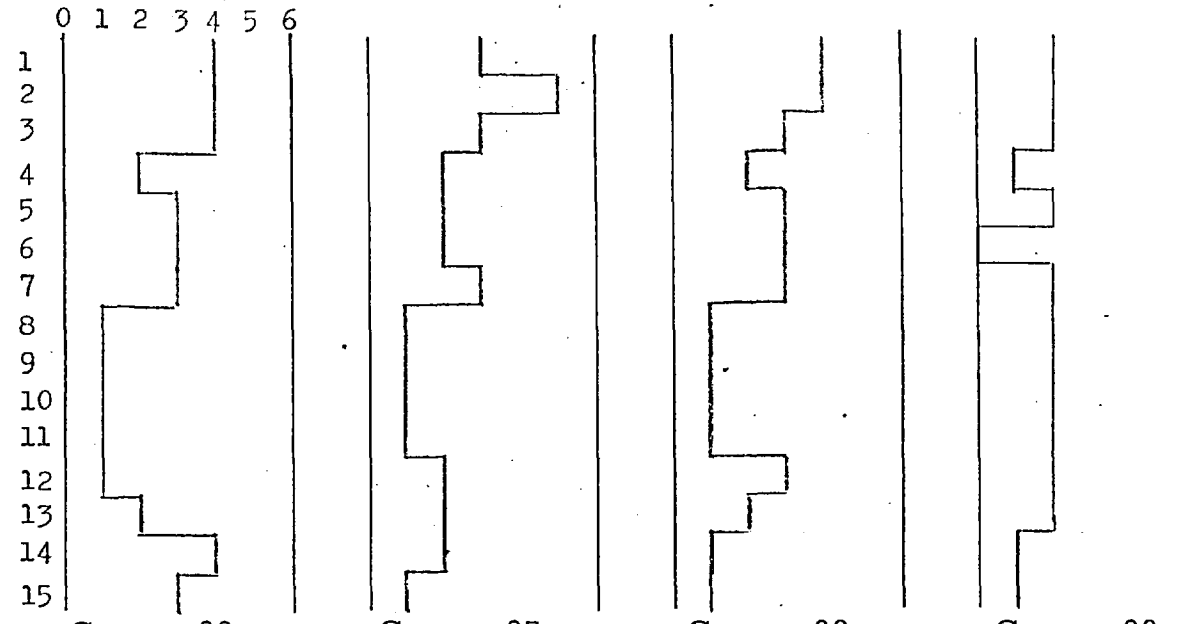


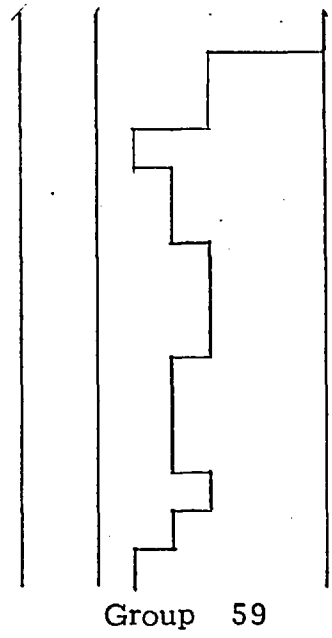




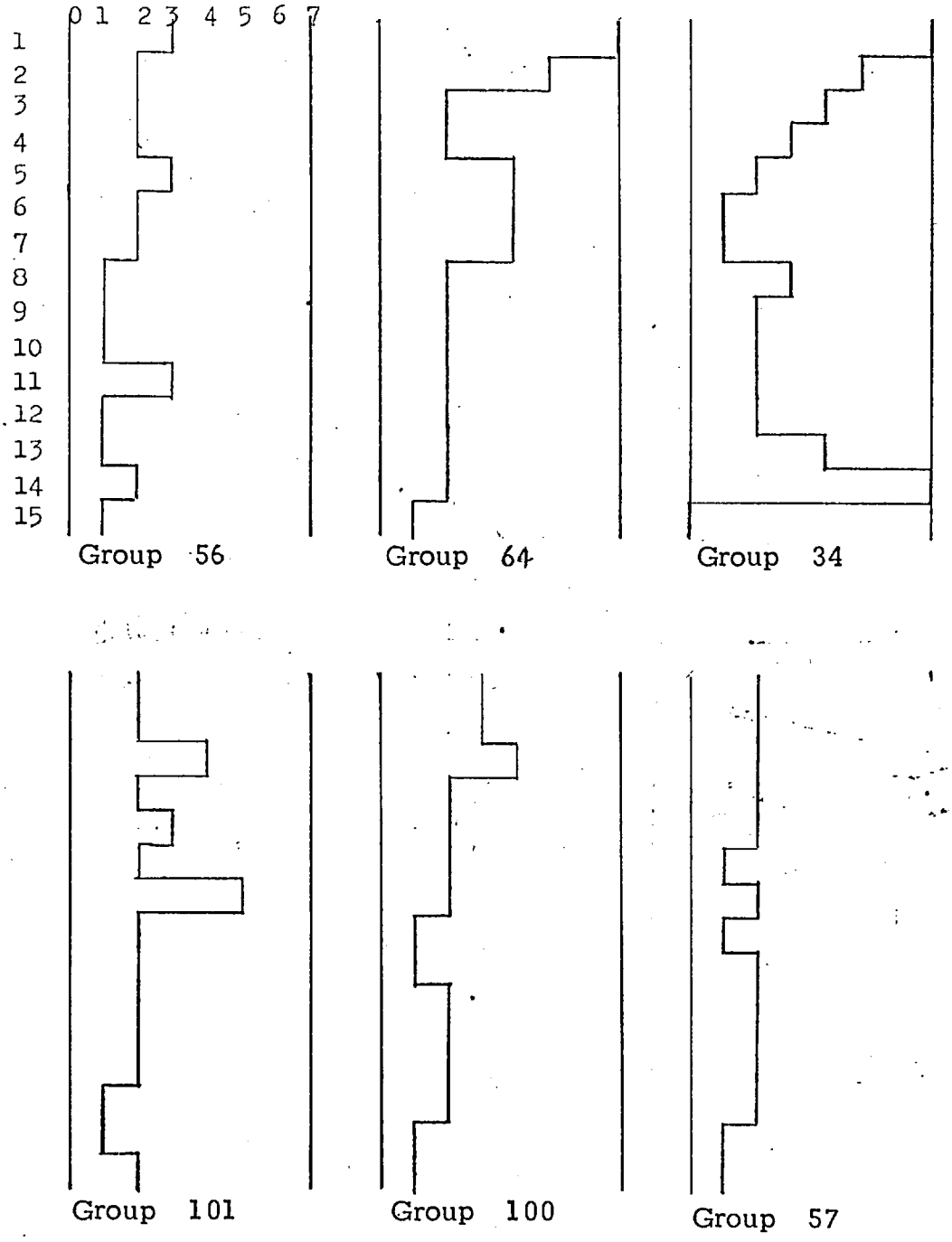
Numbers of Individuals engaged on each task

5 member Groups

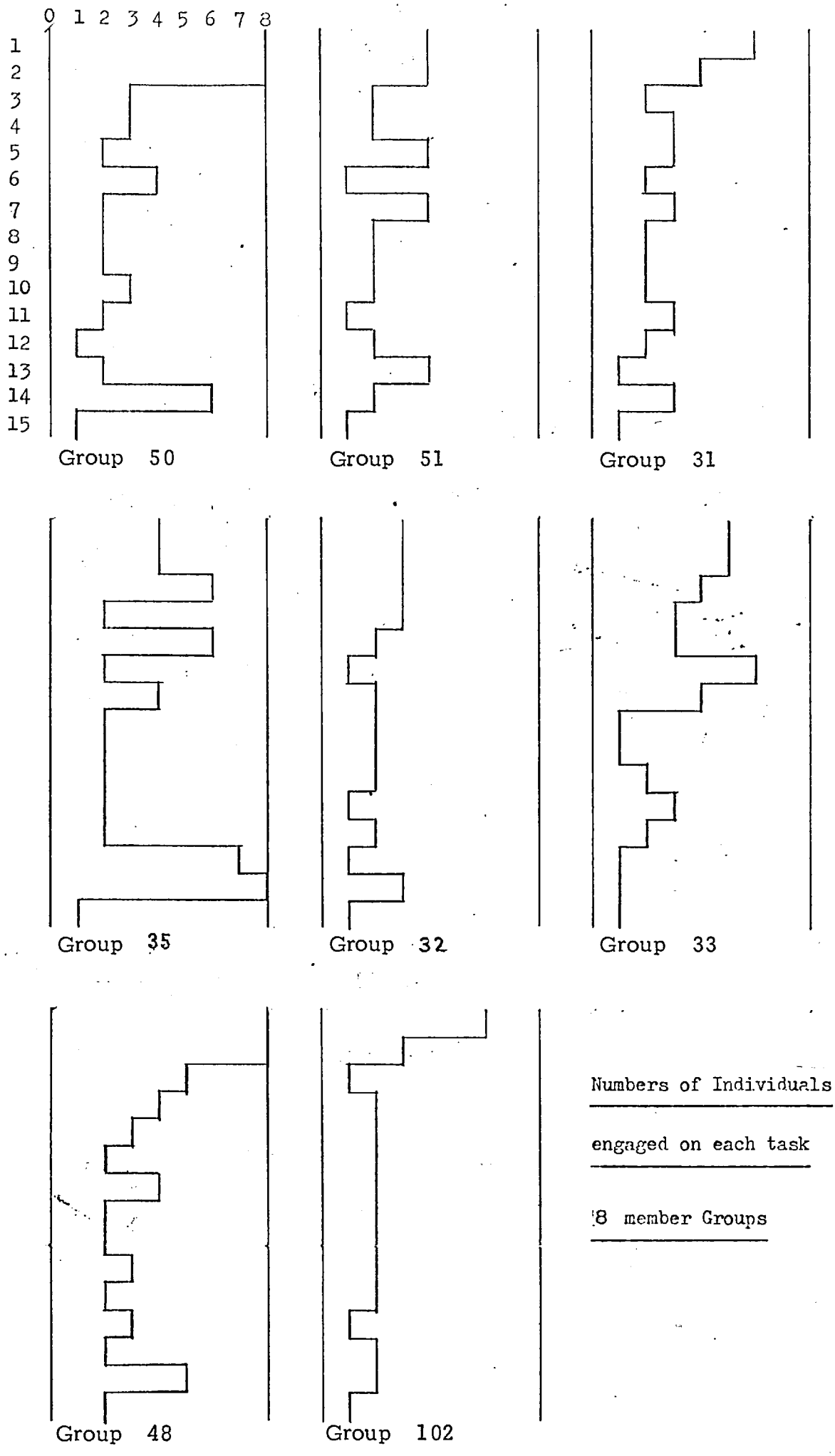




Numbers of Individuals engaged on each task : 6 member Groups



Numbers of Individuals engaged on each task : 7 member Groups


0 1 2 3 4 5 6 7 8
1
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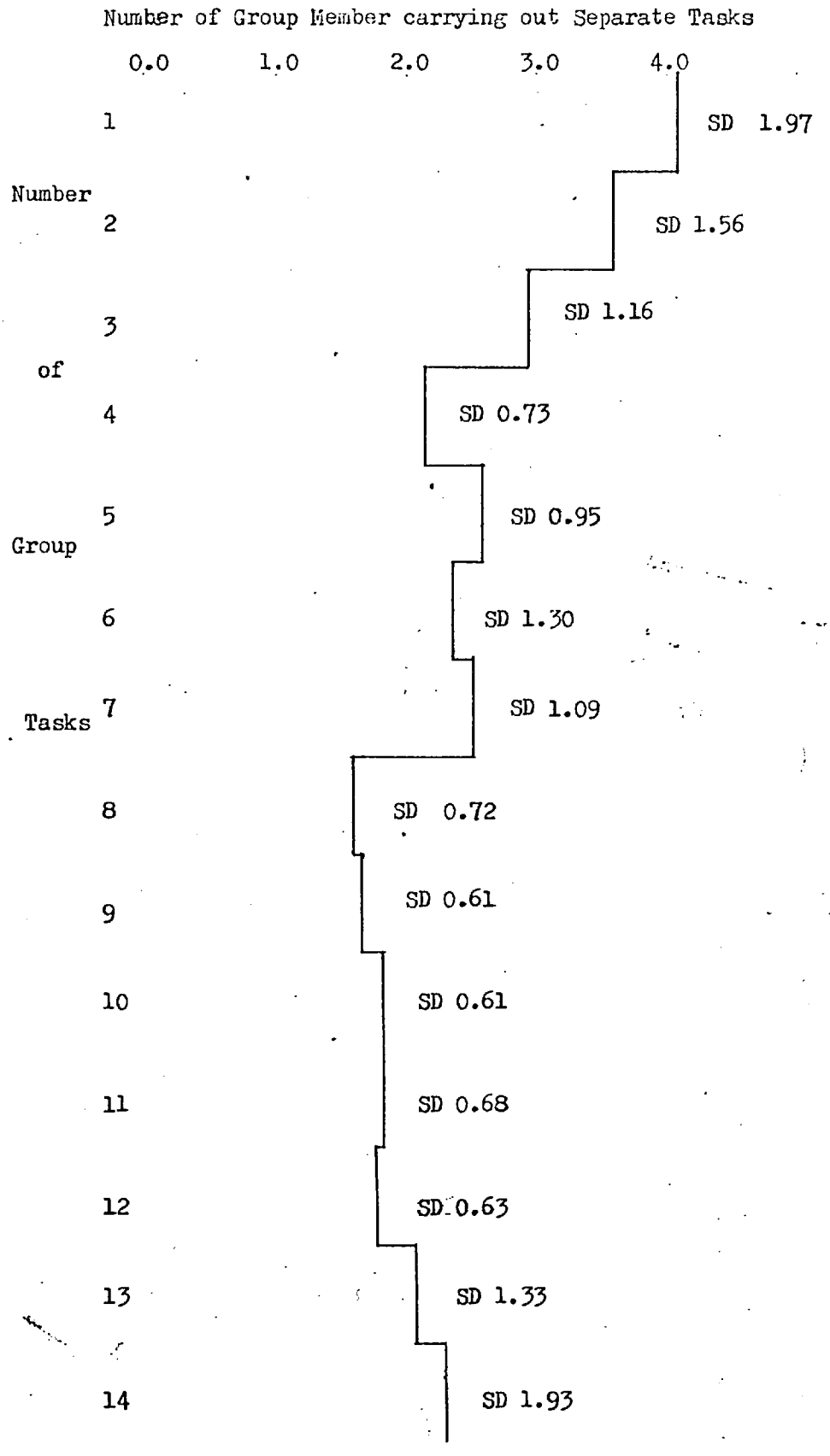
5
6
7
8
9
10
11
12
13
14
15
Group 50
Group 51
Group 31
Group 35
Group 32
Group 33
Group 48
Group 102
Numbers of Individuals
engaged on each task
8 member Groups

SUMMARY GROUP TASK STRUCTURE DATA APPENDIX 9.23

Group Number	Total Number of Tasks / Individuals	Mean Number of tasks carried out by each member	Mean Number of members per. group task
55	29	5.80	2.07
56	27	3.86	1.93
57	26	3.71	1.86
64	43	6.14	3.07
50	48	6.00	3.43
51	37	4.62	2.64
52	21	4.20	1.50
53	29	5.80	2.07
54	29	5.80	2.07
29	37	6.17	2.64
30	31	5.17	2.21
28	35	5.83	2.50
25	24	6.00	1.71
22	30	6.00	2.14
26	27	5.40	1.93
24	32	6.40	2.29
27	30	6.00	2.14
23	23	4.60	1.64
31	38	4.75	2.71
35	55	6.78	3.93
32	31	3.88	2.21
34	45	6.43	3.21
33	42	5.25	3.00
48	55	6.88	3.93
59	39	6.50	2.79
102	32	4.00	2.29
58	24	4.80	1.71
100	29	4.14	2.07
101	34	4.86	2.53

APPENDIX 9.24



Means and SDs of the number of people associated with each itemised task in the BTA Exercise

Group Number

Frequency of all group members responses to the identificatic of the four decision - making categories cumulative over all fifteen tasks

	A	B	C	D
55	13	42	20	0
56	33	40	19	4
57	35	47	8	0
64	64	17	19	2
50	39	60	17	1
51	80	38	2	0
53	33	20	11	0
54	33	33	6	1
52	31	5	7	0
29	43	27	3	1
27	36	29	10	0
28	34	24	11	1
25	46	17	4	0
22	24	36	8	1
26	33	32	5	0
24	38	20	14	2
27	51	15	9	0
23	49	12	7	0
31	78	36	3	0
35	68	21	24	5
32	73	17	13	0
34	39	43	17	1
33	58	36	10	0
48	6	18	95	1
58	41	24	10	0
59	28	33	13	1
100	50	38	2	0
101	66	18	6	0
102	52	14	54	0

Totals of identified decision - making categories used by all members in numbered groups .

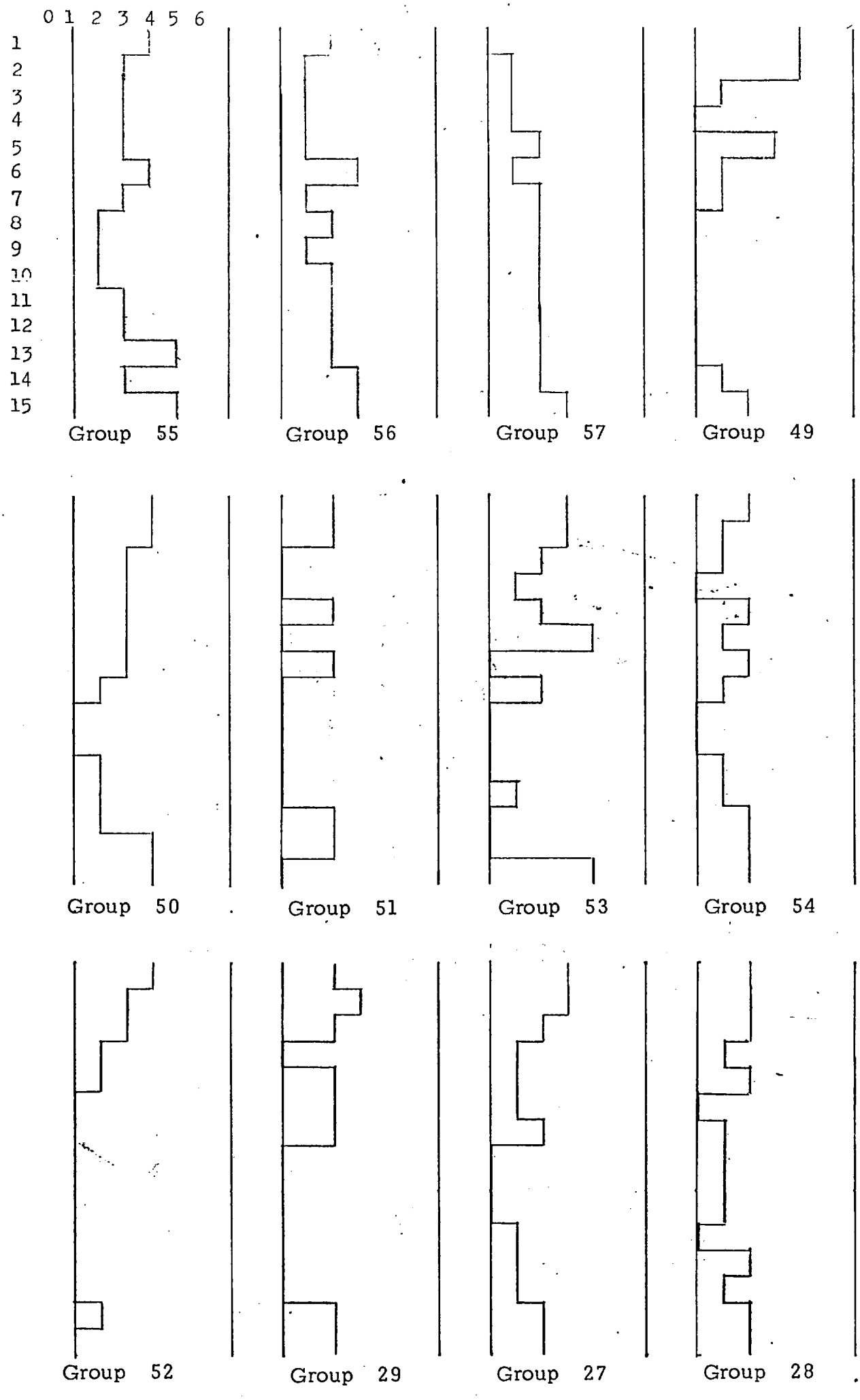
These totals are related to both the actual number of group members , the number of members returning the completed Post - Exercise questionnaire and the completeness of response to this specific question .

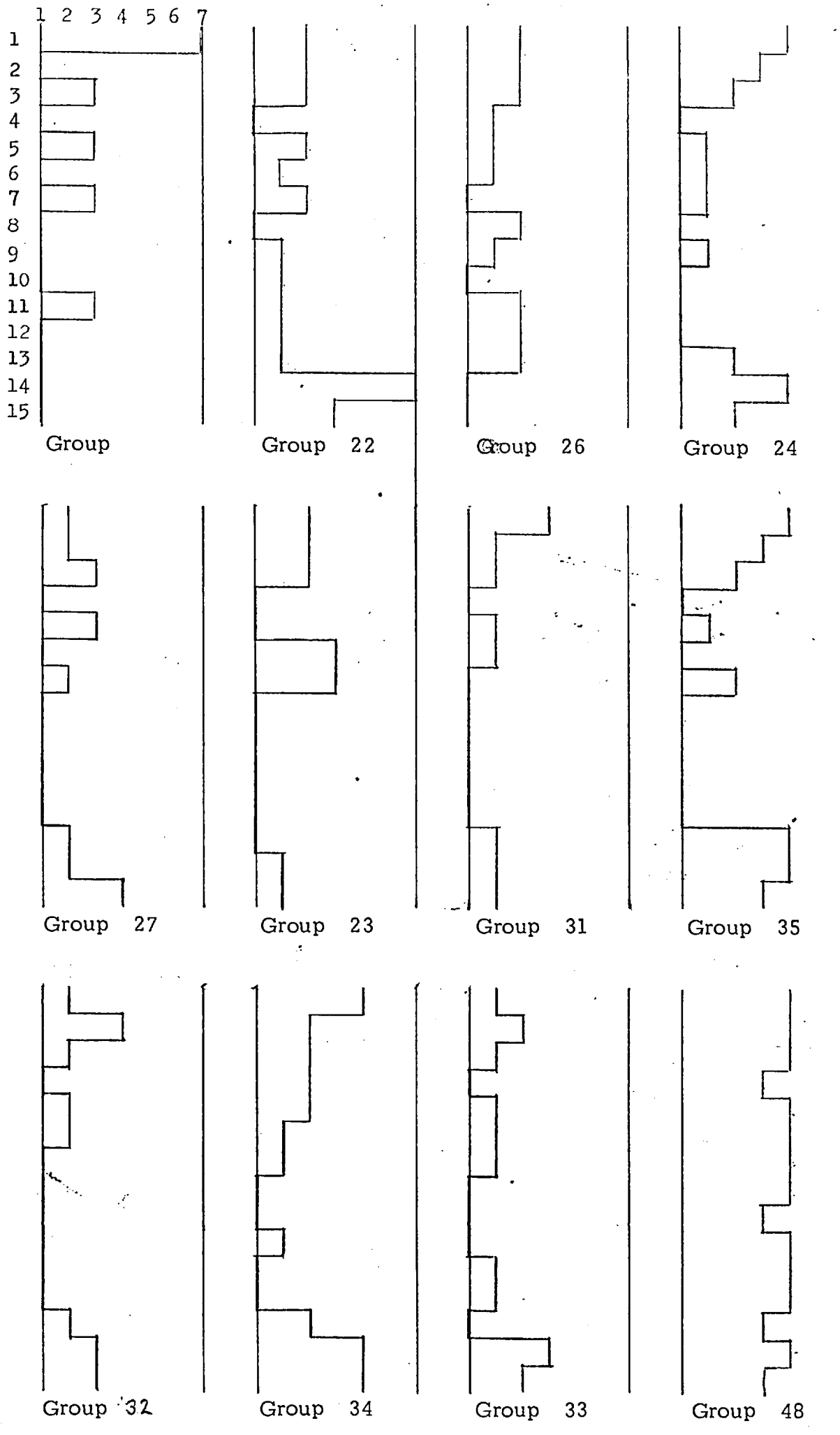
Type of Decision-Making Identified

A	B	C	D
37	62	63	0
25	99	41	0
62	84	21	0
112	51	7	0
66	81	20	2
92	50	18	0
74	63	16	3
121	29	5	0
129	32	4	0
116	38	5	0
101	46	8	0
106	52	6	0
71	51	28	1
57	33	61	2
74	24	48	8

Total numbers of the categories of decision-making identified by all BTA course members for each of the 15 itemised tasks .

SEE LAST PAGE OF THIS APPENDIX FOR A DESCRIPTION




1 2 3 4 5 6 7
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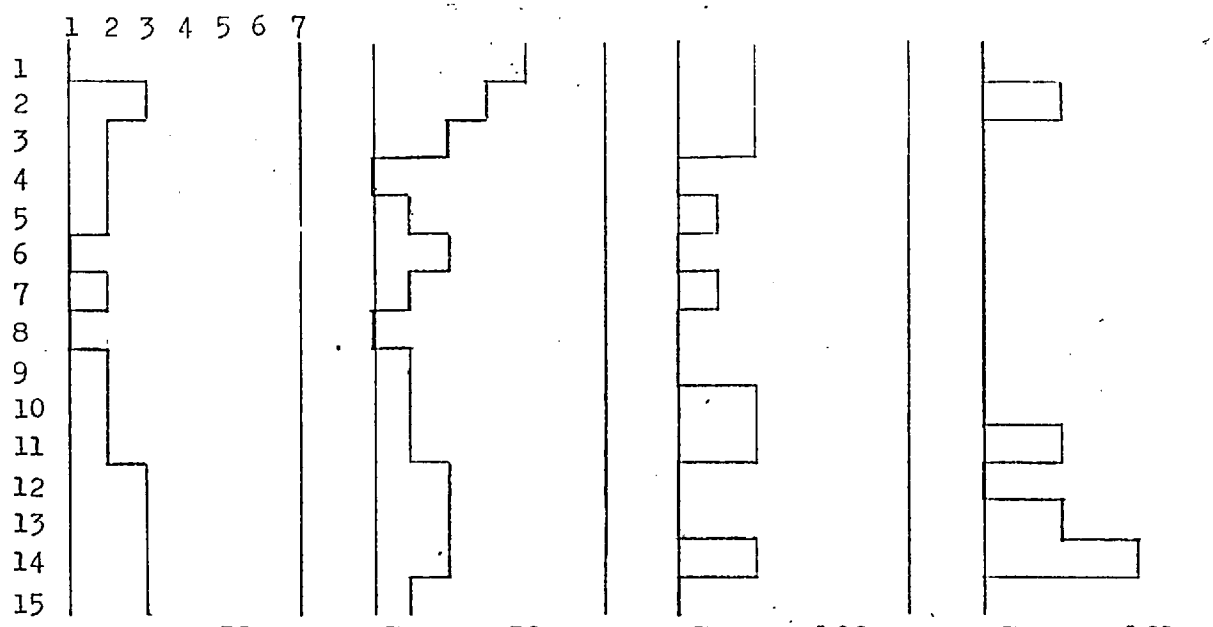
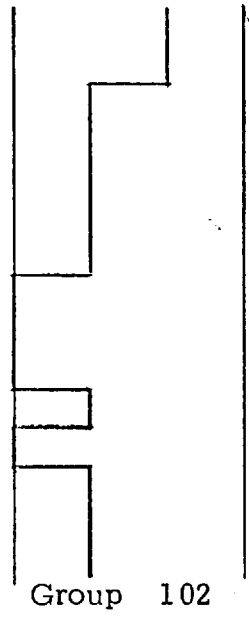
Group
Group 22
Group 26
Group 24
Group 27
Group 23
Group 31
Group 35
Group 32
Group 34
Group 33
Group 48





Type of Decision - Making Identified with each of the 15 Task Categories

Entries in positions 1 , 3 , 5 , and 7 correspond to the median response for that particular task occuring in decision category types : - A , B , C , and D respectively .

Entries in positions 2 , 4 , and 6 indicate that there was not a clear median position and that an intermediate position between the categories has been introduced .

APPENDIX 9.2E

Decision Making Categories associated with the Fifteen Tasks for each Group

Group Number	1	2	3	4	5	6	7
55		3	8	2	2		
56		6	6	3			
57	1	4	9	1			
64	7	4	1	1	2		
50	2	4	5	4			
51	9		6				
53	6	2	3	2	2		
54	3	6	6				
52	9	3	2	1			
29	7		7	1			
27	3	6	4	2			
28	2	6	7				
25	10		4				1
22	2	6	5	1			1
26	4	4	7				
24	5	4	3	1	2		
27	7	5	2	1			
23	8	2	3	2			
31	7	7		1			
35	7	1	2	2	3		
32	7	5	3				
34	4	3	5		3		
33	5	7	2	1			
48				4	11		
58	3	7	5				
59	2	6	5	1	1		
100	7	2	6				
101	11		3	1			
102	4		9		2		

Cumulative mean decision category chosen for all fifteen listed tasks for all groups

APPENDIX 9.29

Task Number	Frequency of median decision making categories associated with each listed task						
	1	2	3	4	5	6	7
1	3	4	8	5	7		1
2	1	5	12	8	3		
3	2	8	18		1		
4	16	8	4	1			
5	2	12	13	1	1		
6	9	11	4	3	2		
7	6	10	11	1	1		
8	20	4	4		1		
9	18	8	1	1			
10	19	6	3		1		
11	13	7	8		1		
12	15	6	7		1		
13	8	7	11	1	2		
14	3	5	12	3	5		1
15	6	3	10	8	2		

Median decision categories for each listed Task for the Group Population (N is 29).

APPENDIX 9.30

Measure of Correlation between the number of group members reported as engaged on a Task and the corresponding type of Decision - making identified for that Task :

Category of Decision-making listed for each task	Number of People working on each Topic				
	1	2	3	4	5 +
1	60	70	9	1	1
2	29	52	14	6	3
3	32	53	25	13	3
4	5	8	7	8	4
5 +	3	3	5	6	13

Contingency Table for Non - Parametric Data

contingency coefficient is 0.552 .

The equivalent chi-squared figure is 146.437 . This significant at well beyond the 0.01 level of Statistical Significance (Chi-suared for 0.01 level is 39.29)

Hence the type of decision - making reported by individuals for particular topics is directly related to the number of people who have been identified in that group as actually engaged in that topic .

Summary : Total amount of individual and interactive activity associated with individuals in the groups carrying out the B T A Exercise .

The groups are arranged in order of the number of members in the group .

The two numbered axes for each group give the number code for each member of the group . The entries with each table gives the total number of episodes in the observation record for that group when the two people , indicated by the position in the table with respect to the two axes , were interacting . The number of episodes when an individual was entered in an episode as not communicating with anyone else in the group is entered in the " interacting with himself " position : for example , 3 , 3 and 7 , 7 .

1	5							
2	6	7						
3	5	9	9					
4	4	3	6	4				
5	3	3	3	5	3			
6	4	2	6	5	3	6		
7	2	0	2	3	0	2	10	
8	3	2	3	0	3	4	9	6
	1	2	3	4	5	6	7	8

Group 6 5

1	11							
2	3	17						
3	2	10	14					
4	4	5	4	7				
5	4	2	3	10	12			
6	2	0	1	2	0	6		
7	3	0	0	4	0	12	5	
8	2	3	4	4	0	4	6	8
	1	2	3	4	5	6	7	8

Group 6 6

1	5							
2	5	6						
3	2	3	5					
4	2	0	10	11				
5	3	3	3	0	2			
6	3	2	0	1	2	4		
7	5	3	2	3	4	6	7	
8	1	2	0	3	3	5	10	7
	1	2	3	4	5	6	7	8

Group 3 1

1	10							
2	5	8						
3	4	3	6					
4	2	1	3	9				
5	1	0	2	4	15			
6	6	3	7	2	1	7		
7	7	4	3	0	0	12	5	
8	3	10	2	1	0	3	2	7
	1	2	3	4	5	6	7	8

Group 3 3

1	11							
2	8	3						
3	3	7	7					
4	2	1	5	7				
5	0	2	3	5	13			
6	1	1	3	3	8	9		
7	0	1	2	0	1	3	6	
8	2	3	1	2	0	4	8	4
	1	2	3	4	5	6	7	8

Group 3 2

1	9							
2	5	6						
3	2	6	5					
4	5	4	10	7				
5	6	5	0	5	8			
6	0	3	0	1	2	12		
7	5	2	2	3	4	4	6	
8	4	3	0	2	3	0	8	7
	1	2	3	4	5	6	7	8

Group 1 0 2

1	8						
2	2	7					
3	8	9	4				
4	6	2	3	10			
5	1	3	3	1	12		
6	3	6	8	0	8	8	
7	0	0	2	3	1	3	15
	1	2	3	4	5	6	7

Group 5 6

1	10						
2	10	8					
3	2	1	3				
4	1	0	8	1			
5	3	5	7	8	1		
6	4	3	4	3	2	3	
7	1	3	2	3	4	5	3
	1	2	3	4	5	6	7

Group 3 4

1	9						
2	3	17					
3	4	1	10				
4	2	6	2	9			
5	2	0	5	2	11		
6	3	0	3	2	1	7	
7	6	0	4	2	5	7	2
	1	2	3	4	5	6	7

Group 1 0 1

1	17						
2	3	5					
3	2	8	12				
4	2	7	2	15			
5	0	2	0	2	9		
6	0	3	2	0	9	7	
7	1	4	1	0	8	6	5
	1	2	3	4	5	6	7

Group 6 4

1	12						
2	4	7					
3	2	1	10				
4	1	1	3	11			
5	3	2	6	5	4		
6	5	3	1	2	3	8	
7	0	0	3	2	4	5	13
	1	2	3	4	5	6	7

Group 1 0 0

1	9					
2	7	11				
3	5	8	6			
4	2	3	5	13		
5	1	2	4	2	10	
6	2	0	4	2	11	8
	1	2	3	4	5	6

Group 2 9

1	8					
2	7	6				
3	5	5	10			
4	1	3	3	11		
5	1	2	5	2	13	
6	5	1	1	3	3	15
	1	2	3	4	5	6

Group 30

1	2					
2	8	6				
3	8	7	7			
4	3	2	3	11		
5	3	4	1	2	13	
6	5	6	0	5	5	9
	1	2	3	4	5	6

Group 28

1	4					
2	2	12				
3	1	10	8			
4	7	0	2	7		
5	8	0	3	9	7	
6	6	0	1	2	3	9
	1	2	3	4	5	6

Group 59

1	6					
2	4	17				
3	7	12	18			
4	10	3	2	11		
5	8	1	3	7	12	
	1	2	3	4	5	

Group 55

1	8					
2	6	12				
3	2	10	8			
4	4	4	8	6		
5	0	0	1	6	10	
	1	2	3	4	5	

Group 52

1	6					
2	3	8				
3	2	4	12			
4	8	10	3	2		
5	6	8	5	12	1	
	1	2	3	4	5	

Group 54

1	10					
2	12	18				
3	4	2	4			
4	2	0	6	8		
5	2	0	6	9	4	
	1	2	3	4	5	

Group 53

1	8					
2	3	11				
3	7	1	13			
4	3	4	2	15		
5	5	3	6	1	7	
	1	2	3	4	5	

Group 22

1	18					
2	3	17				
3	0	0	6			
4	1	0	10	9		
5	2	4	5	4	6	
	1	2	3	4	5	6

Group 26

1	6				
2	1	15			
3	7	3	4		
4	2	4	3	3	
5	3	1	8	5	7
	1	2	3	4	5

Group 24

1	6				
2	6	10			
3	8	8	9		
4	6	2	1	11	
5	0	0	2	1	23
	1	2	3	4	5

Group 27

1	13				
2	1	8			
3	2	8	18		
4	2	5	0	14	
5	0	5	0	5	10
	1	2	3	4	5

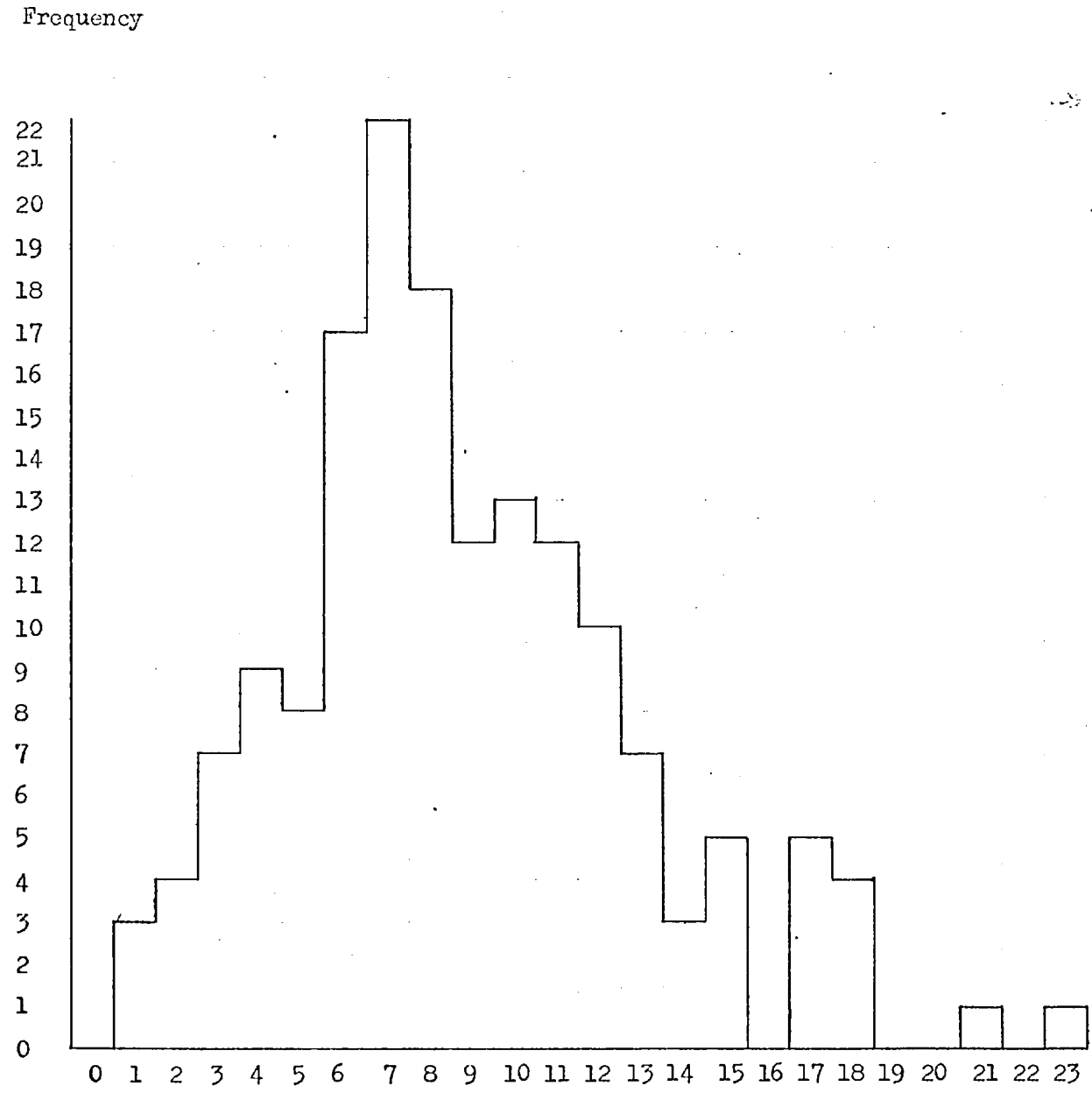
Group 23

1	8				
2	8	12			
3	2	2	10		
4	2	0	4	7	
5	0	2	1	4	11
	1	2	3	4	5

Group 58

1	3			
2	10	7		
3	6	3	8	
4	3	8	1	21
	1	2	3	4

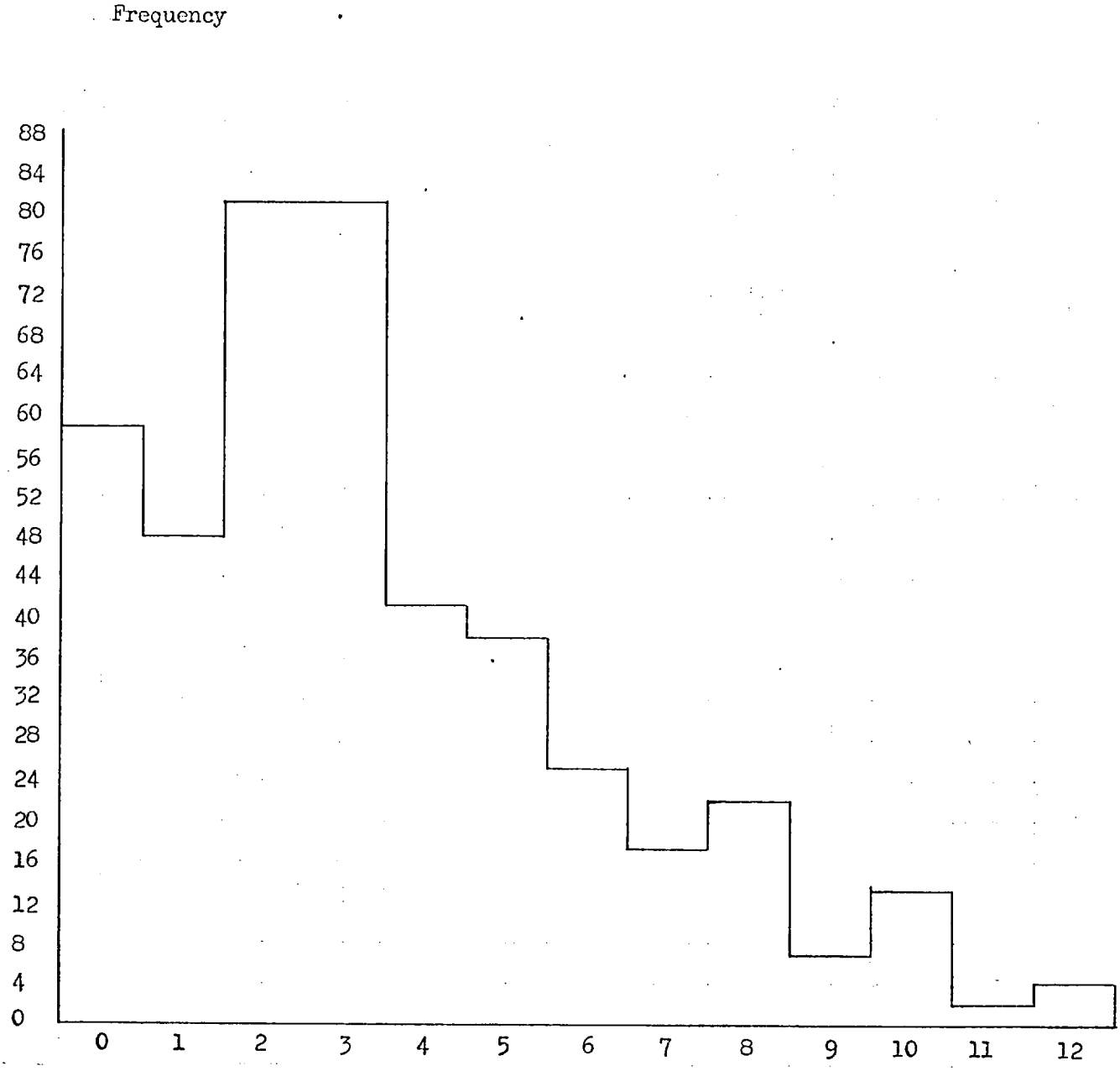
Group 25



Number of episodes for each individual where the individual was observed as not communicating with others in his group

Frequency of episodes in the simulation study when an episode was classified as involving only a single person.

APPENDIX 10.3



Number of episodes that each group member was recorded as being in inter-action with each other (every other group member considered separately) person in the group . Data from all BTA groups where observation recording was carried out .

Frequency of interactive episodes associated with group members .

Analysis of Variance on the Normally Distributed frequency of Episodes were Group Members were identified as working without contact with other members of the group

1. Within group populations of the same size .

Groups with 8 Members (N is 48 group members)

degrees of freedom	Sum of Squares	Mean Square (Variance)
Between Groups 5	85	17
Within Groups 42	470	11.2

Variance Ratio (F) is 1.52 . Value of F needed for 0.05 level of confidence (df , 5 , 42) is 2.44 .

Groups with 7 Members (N is 35 group members)

degrees of freedom	Sum of Squares	Mean Square (Variance)
Between Groups 4	159	39.7
Within Groups 30	469	15.6

Variance Ratio (F) is 2.55 . Value of F needed for 0.05 level of confidence (df , 4 , 30) is 2.69 .

Groups with 6 Members (N is 24 group members)

degrees of freedom	Sum of Squares	Mean Squares (Variance)
Between Groups 3	25	8.33
Within Groups 20	87	4.35

Variance Ratio (F) is 1.90 . Value of F needed for 0.05 level of confidence (df , 3 , 20) is 3.10 .

Groups with 5 Members (N is 50 group members)

degrees of freedom	Sum of Squares	Mean Squares (Variance)
Between Groups 9	248	27.6
Within Groups 40	1098	27.4

Variance Ratio (F) is 1.01 . Value of F needed for 0.05 level of confidence (df , 9 , 40) is 2.09 .

2. Between the four populations of different group size .

The single group which had only four members has been excluded from the analysis . Total sample of number of group members is 157 .

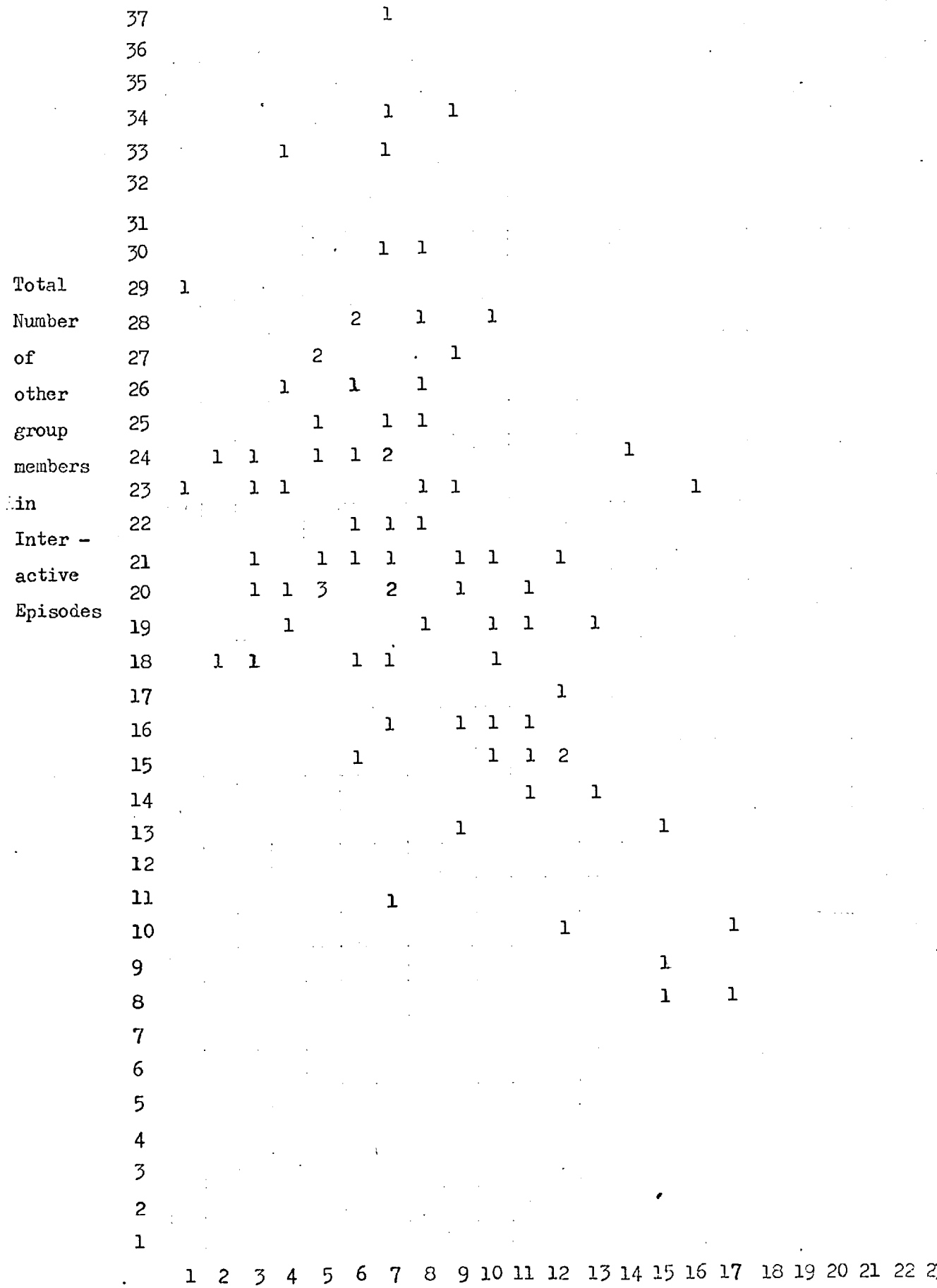
degrees of freedom	Sum of Squares	Mean Squares (Variance)
Between populations of different group size 3	140	46.67
Within populations of different group size 153	2393	15.6

Variance Ratio (F) is 2 . 9 9

Value of F needed for 0.05 level of confidence (df , 3 , 153) is 2 . 66

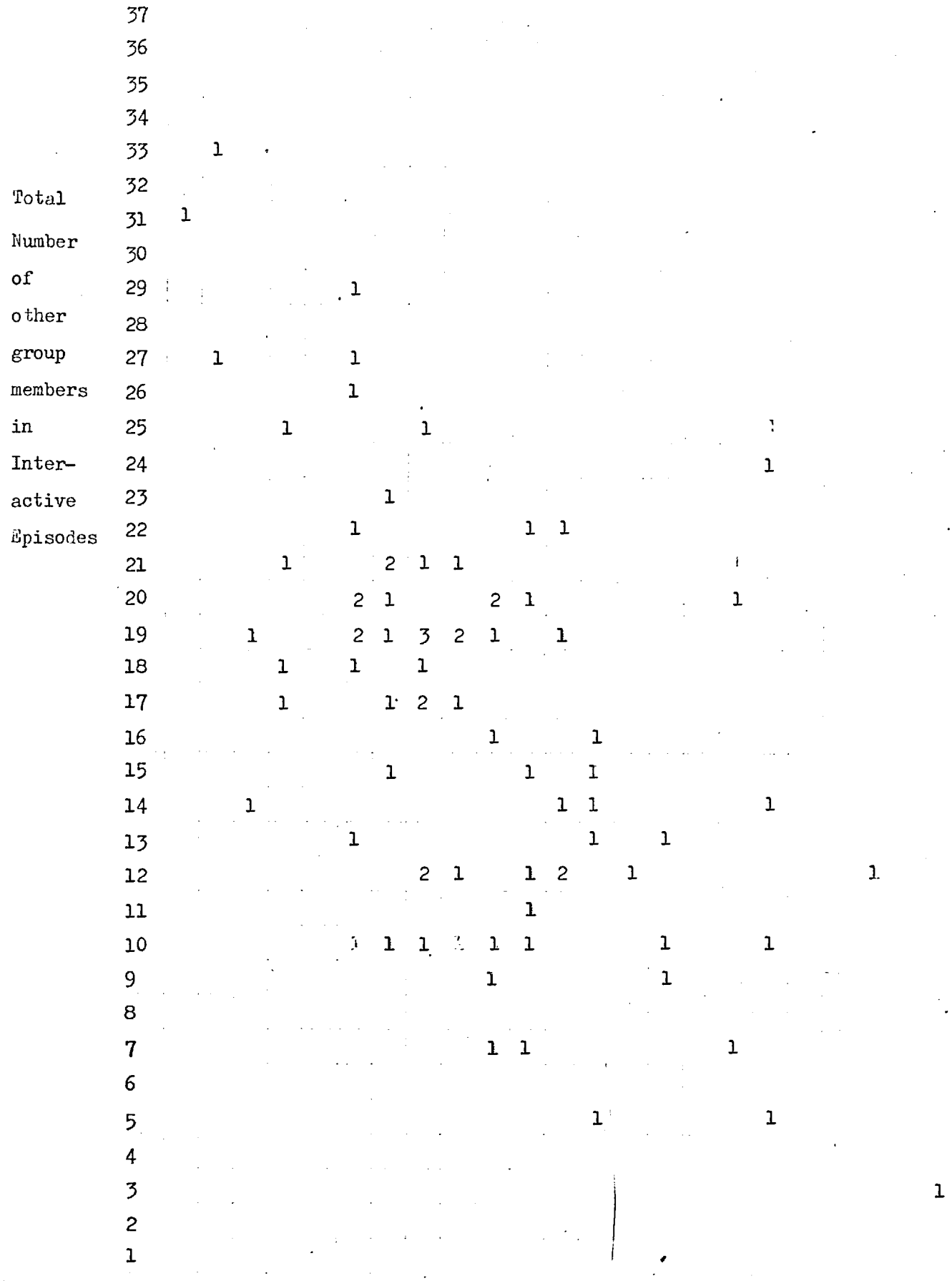
Value of F needed for 0.01 level of confidence (df , 3 , 153) is 3 . 91

Total contact with other group members for each individual in Groups compared with the amount of non-interactive episodes recorded for that Individual . Groups with eight and seven members

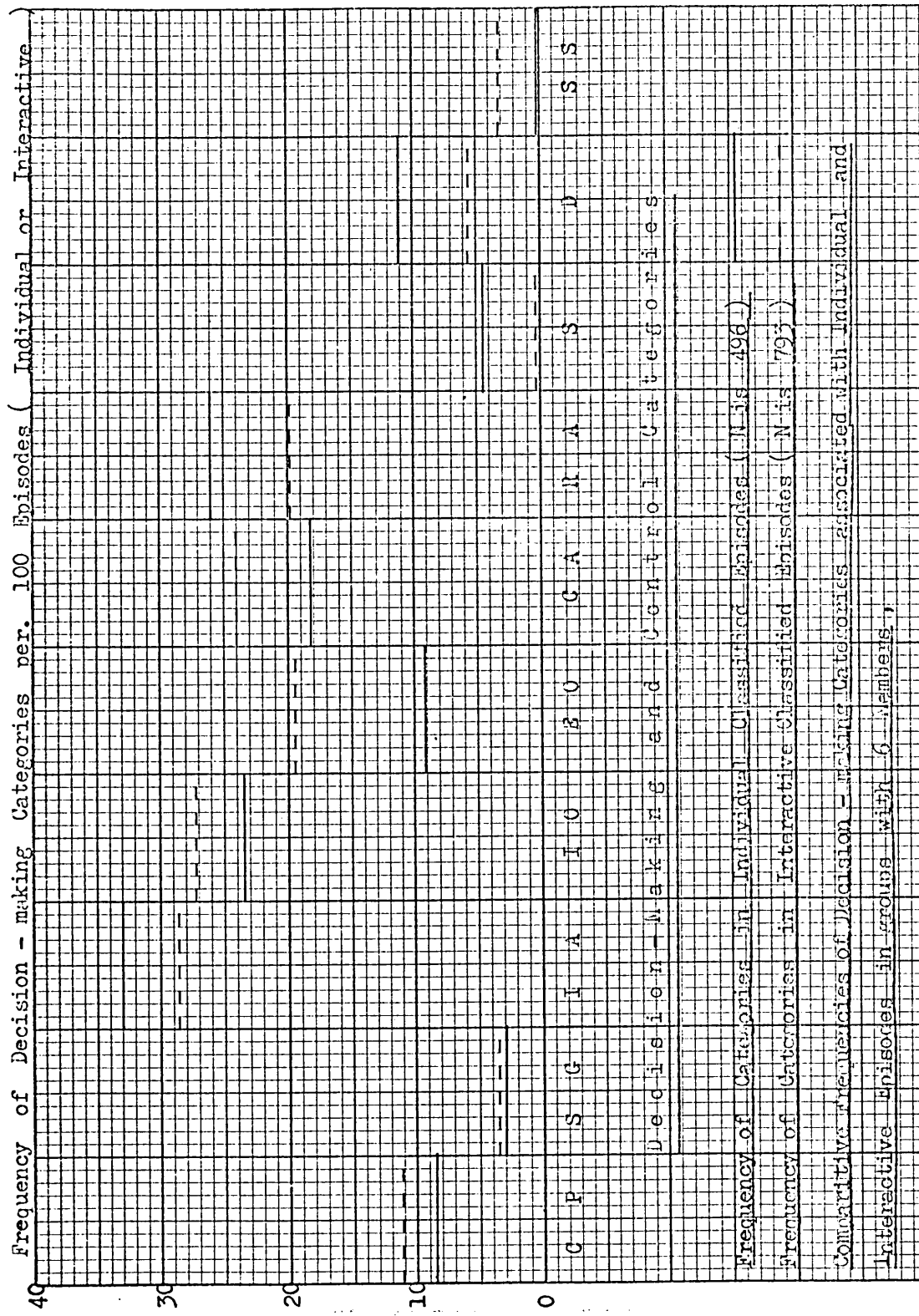


Numbers of episodes , for each member of the BTA Groups , when no interaction with other group members took place

Total contact with other group members for each individual in Groups , compared with the total number of non-interactive episodes recorded for that Individual . Groups with six , five and four members .

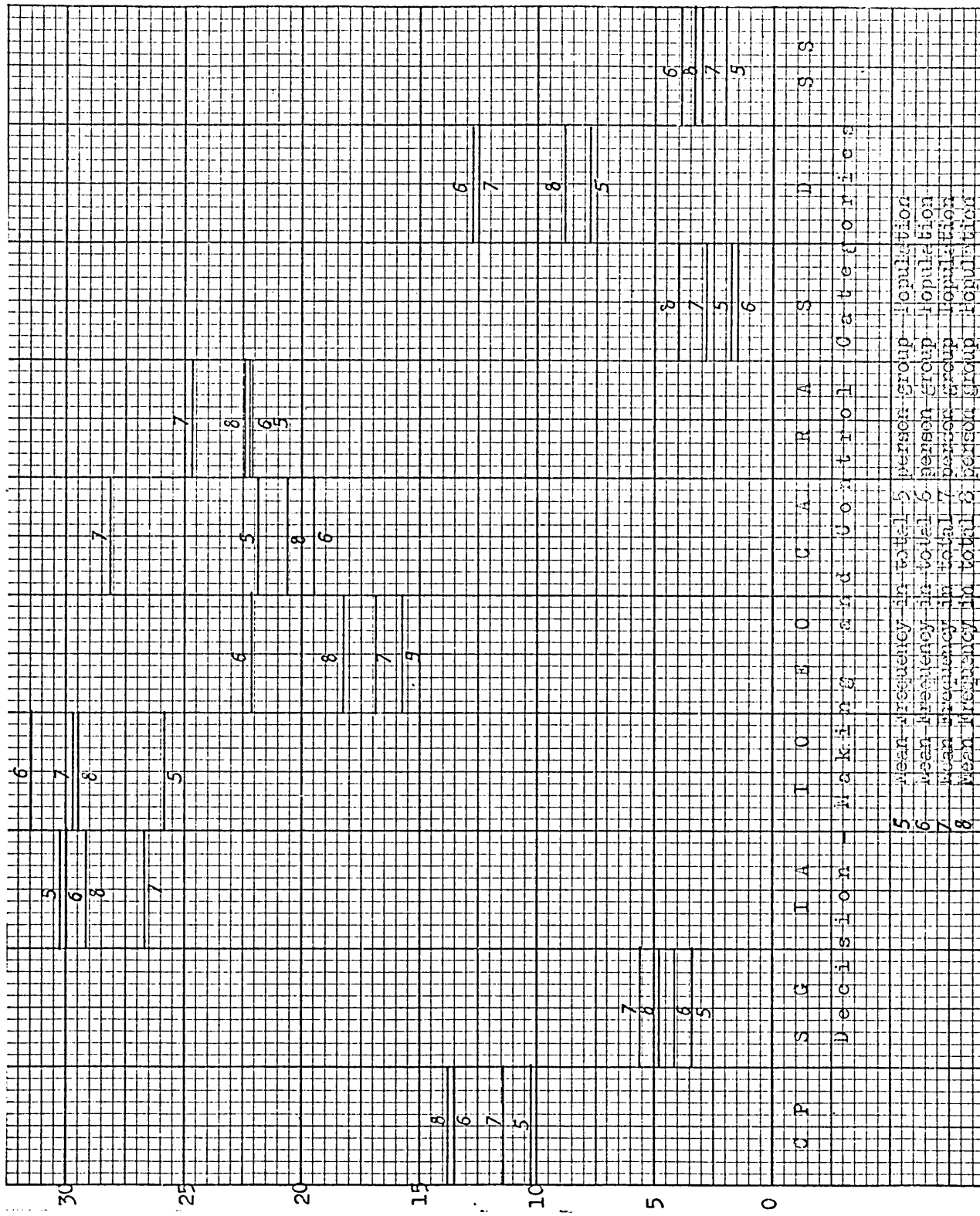


PROFILES OF ACTIVITY PATTERNS FOR INTERACTIVE AND INDIVIDUAL EPISODES .



APPENDIX 10.7

MEAN ACTIVITY PROFILES FOR GROUPS OF DIFFERENT SIZE



APPENDIX 10.8

MEAN FREQUENCIES OF ACTIVITY CATEGORIES FOUND FOR EACH GROUP

	CP	SG	IA	IO	EO	CA	EA	S	D	SS	NF
55	8.2	2.4	31.8	35.0	13.4	23.2	24.0	0.2	3.2	0.4	0.6
56	10.3	3.1	23.0	37.7	8.3	27.6	31.9	0.6	12.4	4.1	0.9
64	12.3	10.7	35.0	31.4	19.3	18.9	26.4	0.3	13.4	4.0	0.3
50	18.0	6.6	34.4	25.9	15.1	23.4	20.6	3.4	4.0	3.9	0.6
51	16.3	2.5	29.1	23.6	17.0	19.5	29.4	2.9	5.1	0.4	0.5
52	10.2	9.0	28.0	17.2	12.6	25.4	30.6	0.4	10.0	3.6	0.8
53	15.0	0.2	41.4	33.6	17.8	19.2	22.0	1.2	7.4	1.4	0.0
54	8.2	4.4	27.6	20.0	11.4	16.6	29.2	2.6	4.8	0.4	0.6
29	13.3	3.7	30.2	30.7	21.0	24.2	18.5	3.3	13.8	4.2	0.5
30	15.3	6.8	29.2	35.7	18.5	20.3	19.3	1.7	10.2	5.2	0.0
28	8.2	3.8	27.0	30.7	28.2	18.5	27.7	1.3	12.8	2.0	0.3
25	2.2	4.5	23.8	25.0	18.2	24.2	30.5	0.8	8.8	2.2	3.5
22	3.4	5.6	20.2	17.4	9.8	31.0	16.4	2.4	6.6	6.4	2.0
26	8.8	1.6	26.2	24.6	15.0	27.4	24.2	0.4	7.4	3.2	0.0
24	11.0	2.4	25.6	23.4	17.8	17.8	18.4	1.8	15.2	3.0	1.2
27	10.4	4.2	27.6	25.2	18.0	21.4	12.8	2.4	8.8	1.4	1.0
23	8.6	0.6	26.4	26.8	16.6	18.8	19.4	3.8	6.8	0.2	0.8
31	13.6	4.9	29.6	26.5	22.1	23.6	22.9	8.0	13.1	0.4	0.9
32	12.4	3.0	30.9	22.4	16.1	14.4	20.5	5.9	5.9	2.4	0.9
34	15.1	6.7	29.4	25.3	19.7	18.4	23.6	4.7	6.3	3.7	1.3
33	16.4	7.9	31.5	23.0	21.6	20.4	14.5	2.6	15.6	9.5	0.6
59	17.7	2.2	33.7	28.8	20.3	15.0	24.7	0.3	12.7	3.7	0.0
102	6.4	3.6	19.5	18.0	17.4	22.9	29.6	1.5	9.4	2.4	0.4
58	18.4	3.0	38.4	32.6	24.2	17.6	25.4	3.6	7.8	0.4	0.8
100	10.9	0.0	24.3	28.7	17.6	26.9	17.3	2.4	18.7	0.3	0.7
101	7.7	7.7	22.4	25.7	19.4	24.4	24.1	3.7	12.4	3.4	2.6

Mean Group Frequencies of Categories in the Model of Decision - Making Activity .

Incidence of each category per. 100 episodes .

Variance Ratio (F) Table for the Four Populations of Group Members

Frequency of Decision - making Categories associated with each individual in the group populations (frequency per. 100 episodes)

Decision Making Category	5 Member Population	6 Member Population	7 Member Population	8 Member Population
Clarrify Problem	4.09^{XX}	3.40^{X}	3.57^{X}	3.51^{XX}
Identify Action	2.30^{X}	1.62	2.03	1.48
Identify Outcome	2.81^{X}	2.43	2.89^{X}	2.02
Evaluate Outcome	3.65^{X}	3.27^{X}	3.41^{X}	3.62^{XX}
Choose Action	2.66^{X}	3.16^{X}	3.00^{X}	2.40
Effect Action	2.50^{X}	3.08	2.71^{X}	2.79^{X}
Discriminate	2.95^{XX}	3.38^{X}	3.03^{X}	2.83^{XX}
	df 40 , 9 (0.05) F is 2.14 (o.01) F is 2.80	df 20 , 3 (0.05) F is 3.10 (0.01)F is 4.94	df 30 , 4 (0.05)F is 2.69 (0.01)F is 4.02	df 42 , 5 F is 2.44 F is 3.49

Entries in the table are the F values for between group variance compared with the within group variance . Results which are significant at the 0.05 and 0.01 levels are indicated by X and XX , respectively .

RANKED FREQUENCY OF DECISION-MAKING AND CONTROL CATEGORIES

Rank	5 Member Groups	6 Member Groups	7 Member Groups	8 Member Groups
1	Clarify Problem	Clarify Problem	Clarify Problem	Evaluate Outcome
2	Evaluate Outcome	Discriminate	Evaluate Outcome	Clarify Problem
3	Discriminate	Evaluate Outcome	Discriminate	Discriminate
4	Identify Outcome	Choose Action	Choose Action	Effect Action
5	Choose Action	Effect Action	Identify Outcome	Choose Action
6	Effect Action	Identify Outcome	Effect Action	Identify Outcome
7	Identify Action	Identify Action	Identify Action	Identify Action

Decision - making Categories arranged in rank according to the degree that the between group variance differs from the within group variance . That is , in descending order of how much the frequency of decision category can be held to be responsible to factors relating to the actual group .

rho (Rank difference) correlation table

No. of Members	8	7	6
5	0.817	0.970 X	0.857
6	0.857	0.929 X	
7	0.857		

All these values are significant at 0.05 probability level .
Those marked with X are significant at the 0.01 level (5 df) .

Table of Correlation Coefficients

	CP		IA		IO		EO		CA		EA	
IA	.105	.157										
	.221	.203										
	.221	.203										
	.189	.214										
IO	2.382	2.421	2.381	2.423								
	1.412	1.442	1.418	1.501								
	1.381	1.375	2.432	2.443								
	2.373	2.389	2.403	2.443								
EO	.224	1.354	.220	1.307	2.439	2.376						
	.353	.297	.186	.323	1.413	.397						
	.243	.315	.324	1.348	1.420	1.385						
	.178	1.302	.253	1.316	1.347	1.287						
CA	-.138	-.213	.081	.124	-.002	.017	-.398	2-.425				
	-.081	-.117	.032	.075	-.083	.056	-.351	1-.419				
	-.247	-.243	.073	.107	-.120	.078	-.284	1-.374				
	1-.291	1-.316	-.154	-.052	.003	.183	1-.336	1-.328				
EA	-.121	.080	.236	.171	-.154	-.183	1.278	1.326	.211	.162		
	.153	.097	.163	-.073	-.117	-.148	.231	.243	.157	-.050		
	.003	-.111	.221	.054	.177	.264	.189	.173	.210	-.084		
	-.037	.102	.198	.253	.201	.271	.191	.223	.176	.232		
D	-.174	-.189	.187	.203	.109	.234	.199	.009	.153	.176	.083	.108
	-.096	.054	.193	.156	.234	.118	.173	.137	.134	.087	.129	.124
	-.153	-.202	.250	.267	.196	.165	.263	.038	.175	.243	.015	.087
	1.285	-.174	.192	.186	.100	.238	.167	.113	.165	1.302	.117	1.292

Frequencies of Decision - making Categories associated with episodes with which each person in the BTA Groups were involved .

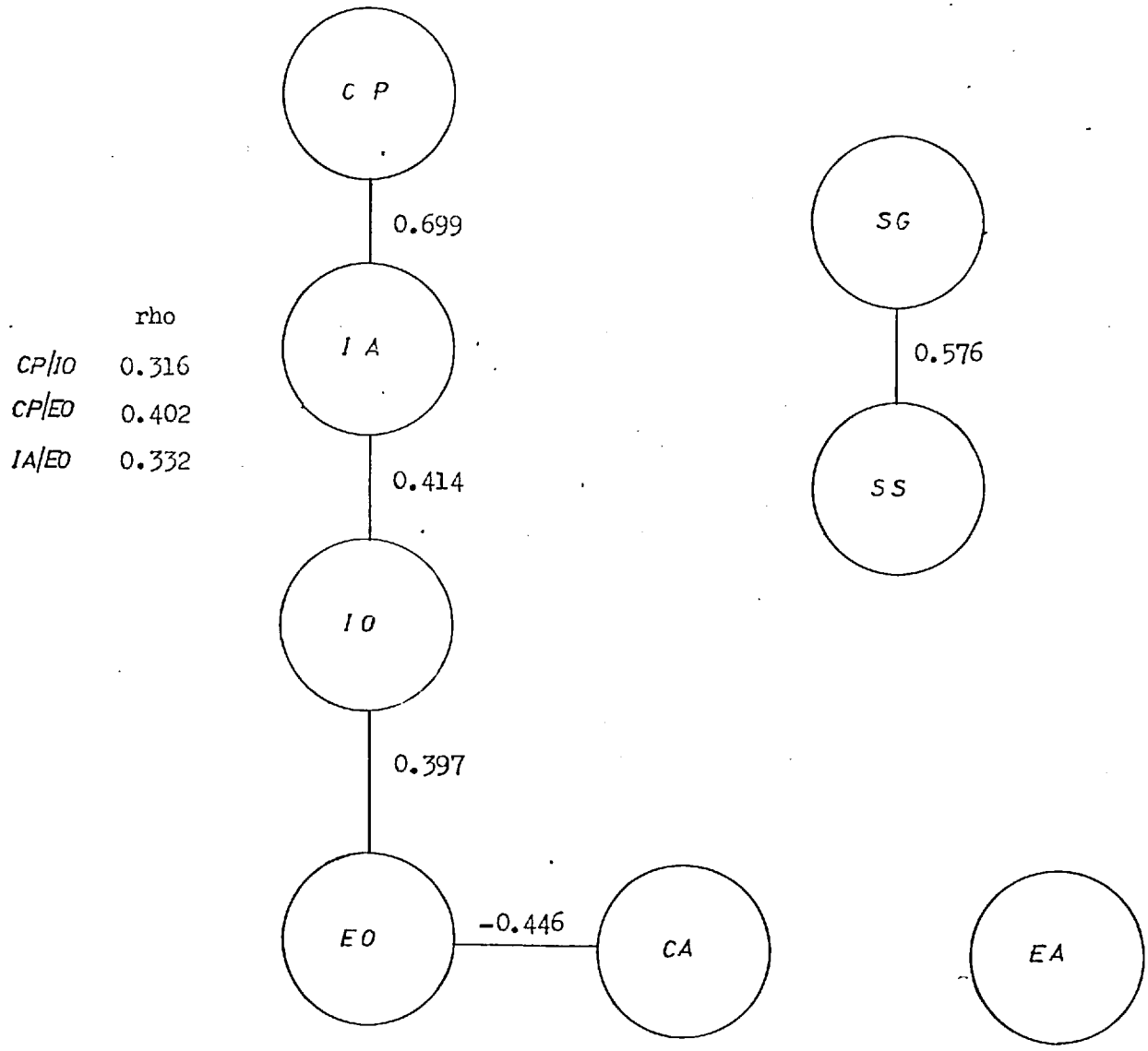
Key (Population) — Individual / Interactive (Episodes)

	Individual	Interactive
5 member		
6 member		
7 member		
8 member		

Levels of Significance	0.05	0.01	0.001
5 member groups	0.278	0.362	0.450
6 member groups	0.404	0.515	0.670
7 member groups	0.337	0.429	0.528
8 member groups	0.284	0.368	0.460

In the table levels of significance at the 0.05 , 0.01 and 0.001 levels are indicated by 1 , 2 and 3 respectively .

Spearman Rank Correlations for Decision Category Frequencies for Groups.



The degree of correlation is indicated by the length of the line joining the categories . Additional correlations not indicated in the figure are shown overleaf .

Values of rho greater than 0.388 and 0.496 are significant at levels of 0.05 and 0.01 respectively (24 degrees of freedom)

Summary of Group Functioning Concepts and obtained Variables

This summary lists , under the four main heads of Group Functioning Concepts - with some intermediate categorisation which has been introduced in sections two to five of part three , the measures obtained directed from the various instruments used in the study of groups carrying out the BTA Business Exercise . Certain important derived measures have been included and indicated (by underlining) .

The prefix § indicates that the measure has been related to other group measures within the same group functioning concept in earlier sections of part three of this thesis .

The Financial Success of Groups .

§Initial (Trial) Profit
§Profit during Exercise
§Change in Profitability
§Cost data in some decision areas

Group Membership

§Implicit biographic and psychometric difference between BMS AMS and Interairline Groups

Biographic

§Age
Organisational Status
Division of Affiliation
§Length of Service

Psychometric

§AH 5
§Pym Flexibility Measure
16 PF (factors B Q1 and Q2 all §)
Connolly Occupational Interest (factors F G and K all §)

Group Structure

Second-order

Inter-decision questionnaire factors implicit in Questions 3 - 13 (all except 5 and 13 are §)

§Post-exercise questionnaire questions 6 - 9 .[1]

First-order

§Number of people carrying out each task
§Type of decision-making associated with each task
§Group size

Group Activity

§Frequency of Individual Activity
§Frequency of Interactive Activity
§Frequency of categories in the decision-making model
§Frequency of all categories in the decision-making model

---

1. Included here is the measure of "error in identifying group task structure " which has been considered (§) in various analyses in appendix 9.21 .

APPENDIX 11.2

	Group Number											
	52	53	54	55	56	57	59	58	60	100	101	102
16 PF												
Factor B												
Mean	8.2	7.6	6.6	7.6	9.1	7.1	7.6	9.2	9.2	8.3	8.3	7.1
SD	1.0	2.0	1.0	1.1	0.5	3.0	2.0	1.0	0.1	2.0	1.0	3.0
Factor Q_1												
Mean	8.0	7.4	6.8	6.4	6.0	5.7	6.9	6.8	6.6	6.5	7.5	7.1
SD	1.6	2.0	4.6	2.0	4.0	2.0	3.5	1.4	1.2	8.0	2.0	1.7
Factor Q_2												
Mean	6.8	6.0	5.0	6.4	7.1	7.0	6.0	6.6	6.6	5.0	6.4	6.3
SD	2.1	4.4	4.1	0.8	2.1	1.3	5.4	2.0	3.3	1.6	2.7	2.1
Connolly												
Factor F												
Mean	33.4	52.4	56.2	51.0	58.6	56.0	49.7	16.4	46.8	39.3	64.2	35.1
SD	14.4	8.5	10.5	16.6	8.4	8.0	11.4	4.9	7.2	9.2	10.2	7.1
Factor G												
Mean	61.8	67.2	63.4	65.8	63.9	65.1	61.0	55.8	68.0	54.8	69.2	59.7
SD	9.2	13.0	15.0	11.5	8.9	10.1	6.4	14.7	7.8	10.5	11.7	10.7
Factor K												
Mean	68.6	45.0	44.4	73.0	47.3	57.3	42.9	60.0	38.8	71.5	57.3	68.8
SD	11.6	9.2	12.6	10.4	13.0	7.6	13.0	14.6	12.2	14.9	12.1	7.9
Initial Profit ('Rank')	1	7	2	10	3	8	11	4	5	12	6	9
Change in Profit (Rank)	7	3	11	10	8	12	2	1	9	4	6	5

Table of group mean values and Standard Deviations associated with the scores on 16 Personality Factors Profile and the Connolly Occupational Interest Questionnaire .

Variable	Initial Profit	Difference between actual and predicted final Profit	df
Mean Age	-0.466 X	0.040	27
SD Age	-0.112	0.283	
Mean AH 5	0.202	-0.071	13
SD Age	0.241	0.314	
Mean Pym score	0.341	-0.119	13
SD Pym score	-0.244	0.071	
16.PF			
Factor B (mean)	-0.224	0.362	10
SD Factor B	-0.652 X	0.168	
Factor Q_1 (mean)	0.242	0.267	10
SD Factor Q_1	-0.276	-0.013	
Factor Q_2 (mean)	0.453	-0.306	10
SD Factor Q_2	0.210	0.224	
Connolly			
Factor F (mean)	0.184	-0.477	10
SD Factor F	-0.076	-0.091	
Factor G (mean)	0.168	-0.427	10
SD Factor G	0.252	0.070	
Factor K (mean)	-0.298	0.040	10
SD Factor K	0.040	0.422	

Rank correlation coefficients between the summary (mean and a measure of range that is , Standard Deviation) psychometric variables and biographic characteristics of a group and the two measures of financial success of that group .

Significant values of rho coefficients

DF	0.05	0.01
27	0.367	0.470
13	0.514	0.641
10	0.576	0.708

Table of correlations of age and psychometric results for groups with the two measures of financial success obtained by groups.

The direction of correlation is indicated by the end of the dimension given in brackets.

Correlations with the Initial Profit

1.00	16 PF Factor B Range (lower)
0.60	Age mean value (lower) 16 PF Factor Q_2 mean value (self - sufficient)
0.40	Pym measure mean value (higher) Connolly Factor K mean value (non - clerical) 16 PF Factor Q_1 Range (lower) Connolly Factor G Range (higher) Pym measure Range (lower) 16 PF Factor Q_1 mean value (liberal) AH 5 Range (higher) 16 PF Factor B mean value (intelligence) 16 PF Factor Q_2 Range (higher) AH 5 mean value (intelligence)
0.20	Connolly Factor F mean value (Social) Connolly Factor G mean value Age Range (lower) Connolly Factor F Range (lower) Connolly Factor K (higher)
0.00	

Correlations with the Change in Profit

0.60	Connolly Factor F mean value (non - Social) Connolly Factor G mean value Connolly Factor K Range (higher)
0.40	16 Pf Factor B mean value (intelligence) AH 5 Range (higher) 16 PF Factor Q_2 mean value (group dependent) Age Range (higher) 16 PF Factor Q_1 mean value (liberal) 16 PF Factor Q_2 Range (higher)
0.20	16 PF Factor B Range (higher) Pym measure mean value (lower) Connolly Factor F Range (lower) Pym measure Range (higher) AH 5 mean value (non - intelligence) Connolly Factor G Range (higher) Age mean value (higher) Connolly Factor K mean value (clerical) 16 PF Factor Q_1 Range (lower)
0.00	

APPENDIX 11.5

Chosen Dichotomies with Question Responses : Inter - decision Questionnair

Question and Population	Category One	Category Two
Question 3 Month 7	Very Busy Busy	Quite Busy Not Very Busy
Question 4 Months 1 and 7	Yes	No In-between
Question 5 Months 1 and 7	Frequent , some or a few occasions	No Occasions
Question 8 Month 1	Poor	Good , adequate and fair
Question 8 Month 7	Complete Good	Adequate , Fair and Poor
Question 11 Month 1	Poor	Adequate , Fair
Question 11 Month 7	Poor Fair	Complete , Good and Adequate
Question 13 Month 1	Middling Only Fair	Excellent Good
Question 13 Month 7	Middling Only Fair	Excellent Good

APPENDIX 11.6

Point Bi - Serial Correlation Coefficients : Inter - Decision Period Questionnaire Responses with Financial Success Measures.

	Initial Profit	Change in Profit	d f
All groups . Busyness response Month seven	-0.174	0.202	19
All groups . Knowledge of what other members expected . Month one	0.451 X	0.067	19
All groups . Knowledge of what other members expected . Month seven	0.323	0.157	19
All groups . Amount of feuding associated with groups . Month one	0.119	-0.104	19
All groups . Amount of feuding associated with groups . Month seven	0.049	0.211	19
Short course . Knowledge of own task in exercise . month one	0.703 X	-0.153	10
Long course . Knowledge of own tasks in exercise . month one	0.670	0.172	7
Short course . Knowledge of own tasks in exercise . month seven	0.617 X	0.213	10
Long course . Knowledge of own tasks in exercise. Month seven	0.667	0.119	7
Short course . Knowledge of others tasks in exercise . month one	0.333	0.356	10
Long course . Knowledge of others in exercise . month one	0.003	0.242	7
Short course . Knowledge of others tasks in exercise . month seven .	0.208	0.428	10

	Initial Profit	Change in Profit	d f
Long course . Knowledge of others tasks in exercise . month seven .	-0.065	0.476	7
Short course . General " morale " month one	0.131	-0.048	10
Long course . General " morale " month one .	-0.091	-0.110	7
Short course . General " morale " month seven ,	0.121	0.583	10
Long course . General " morale " month seven .	0.154	0.432	7

Statistical Significance of Correlation Coefficients

degrees of freedom (N - 2)	0.05	0.01 levels
19	0.433	0.549
10	0.576	0.708
7	0.666	0.798

APPENDIX 11.7

Correlation between the Amount of errors that groups make in the identification of the task structure and the measures of group financial success .

Size of Sample	Group Size	Initial Profit	Change in Profit
8	5 members	0.048	-0.905[2]
5	6 members	- 0.100	-0.400
6	7 members	0.086	-0.750
8	8 members	0.274	-0.333

Coefficient marked with [2] is significant at 0.01 level .

APPENDIX 11.8

Allocation of Tasks and Group Success

Table of rho correlation coefficients

	Initial Profit	Change in Profit
Mean Tasks per Person	-0.234	0.185
Standard Deviation of number of tasks in group	-0.170	0.253

Figure of rho needed for 0.05 level of significance is 0.367 (df 27)

APPENDIX 11.9

Point Biserial Correlation between numbers of group members concerned with three important tasks and measures of financial success .

Task 1 : Evaluating Seat Configurations possible .

dichotomy 1 and 2 and 3 / 4 and more

Task 2 : Consideration of Jet and Prop allocations to routes .

dichotomy 1 and 2 and 3 / 4 and more

Task 3 : Calculating frequencies for routes .

dichotomy 1 and 2 / 3 and more

Table : Correlation coefficients $r_{\text{point biserial}}$

	Initial Profit	Change in Profit
Task 1	0.097	0.271
Task 2	0.137	0.346
Task 3	0.187	0.024

degrees of freedom	0.05	0.01 level
27	0.367	0.470

APPENDIX 11.10

Rank Correlation Coefficients : Frequencies of behaviour categories (mean for group) against the group financial success measures .

Decision - making Category Frequencies	Initial Profit	Change in Profit
Clarifying Problem	0.031	0.703[3]
Setting Goals	0.627[3]	-0.137
Identifying Action	-0.063	0.403[1]
Identifying Outcome	-0.616[3]	0.239
Evaluating Outcome	-0.137	0.673[3]
Choosing Action	0.117	-0.447[1]
Effecting Action	-0.068	-0.216
Sensing	-0.023	0.289
Discriminating	0.086	0.320
Setting Standards	0.419[1]	0.031
Total of All Categories	0.123	0.441[1]

Values of rho necessary for specified statistical significance (24 df)

0.05 [1]	0.01[2]	0.001[3] levels
0.338	0.496	0.603

Contingency Tables : Number of Tasks carried out by group members compared with age and scores in the first Psychometric battery.

No. of tasks carried out by individuals	24	28	32	36	40	44	48	52	56
11						1			
10				1					
9				1					
8		1		2					
7	1	2		2					
6	1	4	2	2	2	2	2	1	
5	2	3	5	2	1	4		1	
4	1	2	6	2	1	2			
3			4	1					
2	1			2					

Age in Years

	6	8	10	12	14	16	18	20	22	24	26	28	30	32
11														
10						1								
9			1	1										
8				1					1					
7	1			1	3	1	1							
6		-	2	7		1	1	1						
5		1	1	1	1	1	2		1					1
4		1	1			2	2							
3	1		1	1										
2				1										

Score on A H 5 part one

	12	14	16	18	20	22	24	26	28	30	32	34
11									1			
10					1							
9	1		1									
8				1			2	1	1			
7				1	1	1	1	1	3			
6		2		3	3	2	3		1			
5			1	2	4	2	3	3	1		1	
4		2		1	2	1	1	2	1			
3				1	2							
2		1				1						

Pym Flexibility measure

Contingency Tables : Number of tasks carried out by group members compared with their scores in the second psychometric battery

No. of tasks carried out by group members	1	2	3	4	5	6	7	8	9	10
10										
9										1
8				1			1	1		
7				1		4		1		
6				1		2	1	6	1	2
5		1		1	1	3	3	2	1	1
4					1	2	2	2		1
3					1		2			1
2						2	1	1		
1										

Conservative — Liberal

Q1 (16 PF) Score

	1	2	3	4	5	6	7	8	9	10
10										
9		1								
8					2	1				
7					2	1	3			
6			2	1	3	4	3		1	
5			1	2	5		3	1	1	
4			1		1		2	1		2
3					1	1	2	1		
2				1			2		1	
1										

Dependent — Self - Sufficient

Q2 (16 PF) Score

	0	10	20	30	40	50	60	70	80	90	100
9			1								
8	1					1		1			
7		1		2				1	2	1	
6	2	2		3	1			1	2	1	
5	1	3	1	3		1	1	1	2		
4	1			4	3				1		
3		1				1				1	
2		3				1					

Connolly Factor

Group Number	Group Members carrying out tasks 1 2 3 4 but not tasks 8 9 10 11 12	Group Members carrying out tasks 8 9 10 11 12 but not tasks 1 2 3 4
22	1 2 3 5	4
23	4 5	2 3
24	1 3	2
25	1	4
26	5	
27	2 3	6
28	2 5	3
29	1 2 3 5 6	4
30	1 2 3 4	5 6
50	1 5 8	
51	1 4 5 6 7 8	2 3
52	1 4 5	2
53	2 3 4	5
54	3 4 5	2
55	1 4 5	2 3
56	5 6	4
57	1 2 3 4	
59	1 4 5 6	2 3

	Mean value of group members carrying out activities 1 2 3 4	Mean value of group members carrying out activities 8 to 12
Age	37 . 14	38 . 00
AH 5	14 . 40	14 . 17
Pym Flex.	22 . 87	20 . 08

none of the differences between the means is significant at 0.05 level

Relationship between values of psychometric variables for individuals and a dichotomy of the type of task with which they become involved during the B T A Exercise

	Rank order of the number of tasks carried out by Group Members[1]	Rank order of the cumulative distribution of decision - making identified by group members[2]
Age (N is 22)	- 0.189	0.350
AH 5 (N is 12)	0.829''	0.200
Pym (N is 12)	0.641'	0.003
Q_1 (N is 11)	0.509	- 0.570
Q_2 (N is 11)	- 0.524	0.500
Connolly	- 0.018	- 0.103
Connolly	0.200	0.017
Connolly	- 0.361	0.194

Significant correlations at 0.05 and 0.01 level are indicated by ' and '' respectively .

1. Increasing number of tasks
2. Increasing amount of shared and group decision making .

Table of Rho rank order Correlation Coefficients : Psychometric scores and Structure relating to Groups .

APPENDIX 11.15

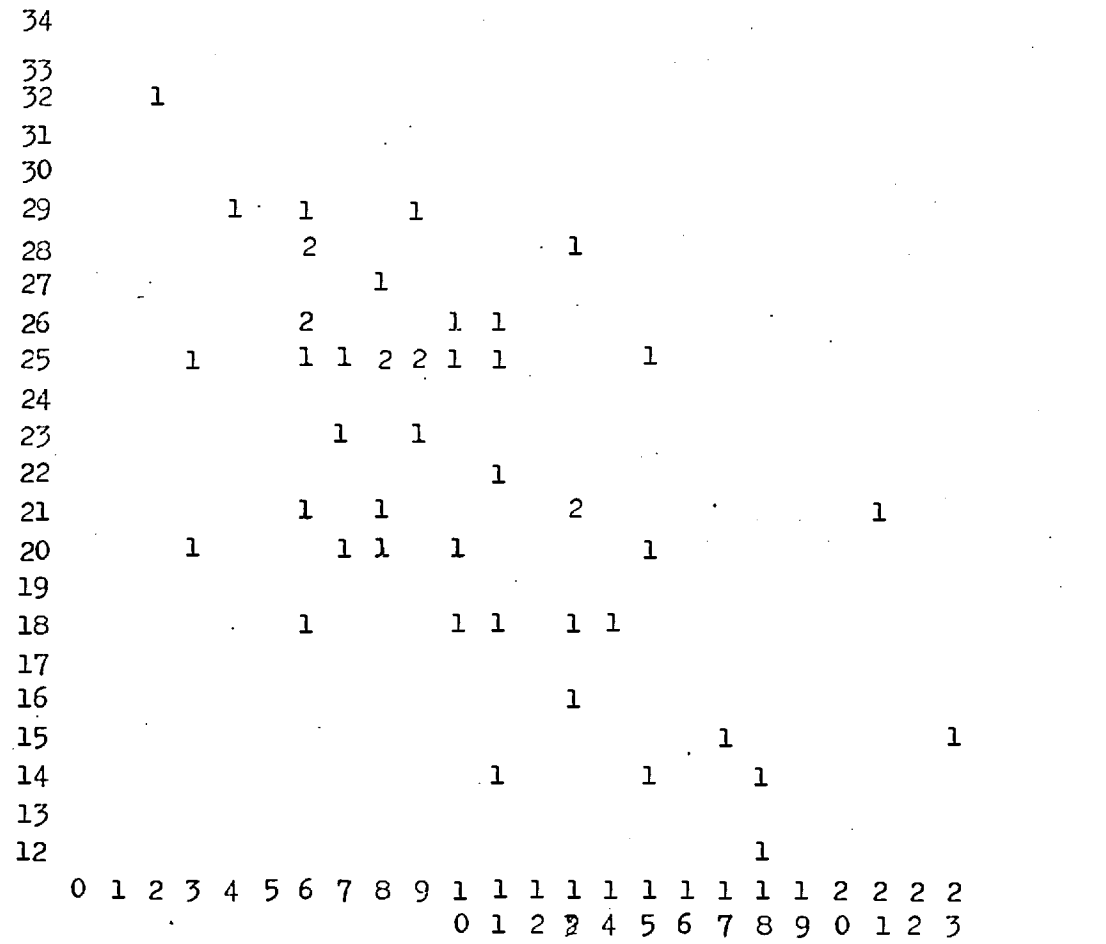
Table of Correlation Coefficients : Mean values and Standard Deviations of Psychometric measures against Frequency of decision - making and control behaviours found with groups .

Decision - making categories are arranged according to groups identified in the inter-correlation exercise

Category	Age Mean	Age SD	AH 5 Mean	AH 5 SD	Pym Mean	Pym SD
Clarifying Problem	-0.109	0.119	-0.317	-0.283	0.398	0.273
Identifying Action	0.487*	0.343	-0.427	0.114	0.429	-0.209
Identifying Outcome	0.148	0.361	-0.329	-0.018	0.441	-0.477
Evaluate Outcome	0.242	0.107	-0.117	0.064	-0.214	-0.250
Choose Action	-0.099	0.048	-0.282	-0.173	0.027	0.596
Effect Action	0.239	-0.051	-0.282	-0.577	0.455	0.045
Setting Goals	-0.316	0.063	-0.336	0.093	-0.066	0.382
Setting Standards	-0.354	-0.126	0.114	0.124	-0.164	0.000
Sensing	-0.221	-0.079	0.036	0.270	-0.182	-0.282
Discriminating	0.010	-0.058	0.036	0.314	-0.262	-0.155
Cumulative All Categories	0.355	0.275	-0.500	0.148	0.371	0.000

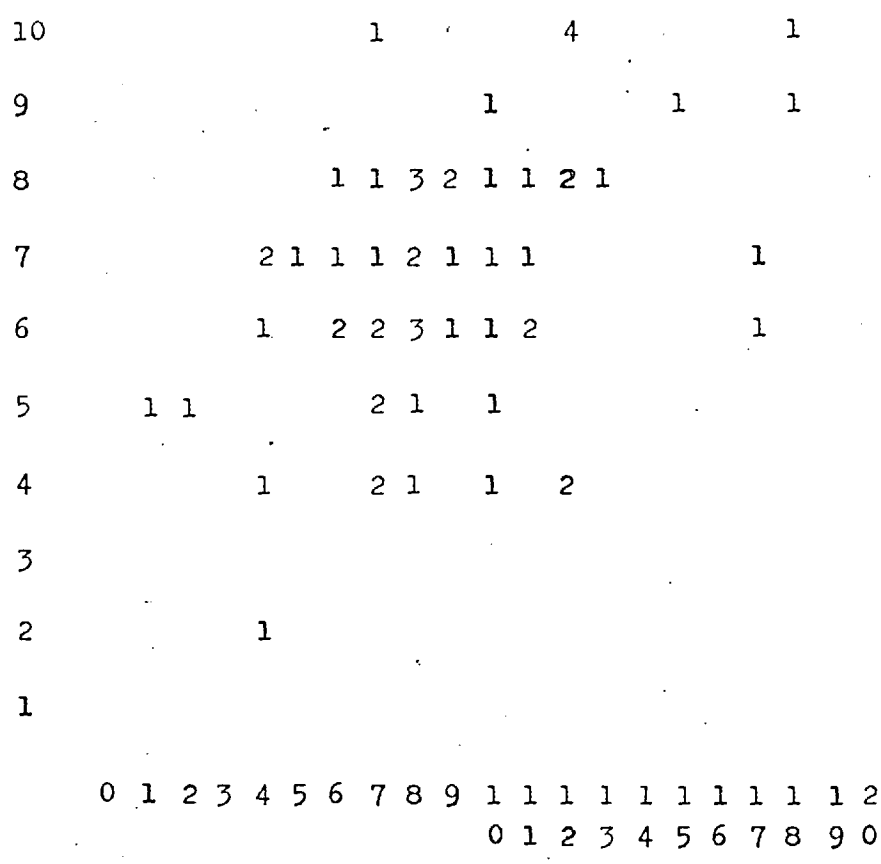
APPENDIX 11.16

Regression analysis of the frequency of interaction associated with individuals in the B T A groups and their scores on the Pym Flexibility measure .



For each individual observed-the number of episodes not interacting

16 PF
Factor Q_1 Scores for individuals
Conservative (ranks 1 , 2 , 3) vs. Liberal (ranks 8 , 9 , 10)



For each individual in the B T A exercise groups : the number of episodes not interacting

Regression analysis of the frequency of non-interactive episodes associated with individuals and their rank scores of Factor Q_1 of 16 PF (conservative / liberal) .

16 PF

Factor Q_2 Scores for individuals

Dependent (ranks 1 , 2 , 3) vs. Self - Sufficient (ranks 8 , 9 , 10)

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
10						1			1							1					
9								1				1	1								
8								2		1	1		1								
7		1	1				3	1	4	1			3					1	1		
6					1				2	1	1	2	2								
5					3		2	3	3		2							1	1		
4					1					1	1	1									
3			1						1			1		1							
2													1								
1																					

For each individual in the B T A exercise groups : the number of episodes not interacting with others .

<u>Regression analysis of the frequency of non-interactive episodes associated with individuals and their rank scores on Factor Q_2</u>

<u>16 PF (dependent / self - sufficient)</u>

Pym Flexibility Scores for the two members of the interaction pair

	12 - 14	15 - 17	18 - 20	21 - 23	24 - 26	27 - 30
30 - 33		3.0	3.0		7.0	
27 - 29	3.0	1.0	4.4	3.7	5.5	8.0
24 - 26	1.0	2.0	3.4	4.0	4.0	
21 - 23	1.0	0.5	4.0	3.5		
18 - 20	1.6	3.0	4.0			
15 - 17	3.0					

Rank Scores on Factor Q_1 - 16 PF - for Interaction pairs

	2	3	4	5	6	7	8
10			3.0	4.0	4.0	5.6	3.2
9	4.5		1.6	3.0	1.5	4.3	2.0
8			3.0	4.2	4.9	3.3	2.6
7	3.7		4.8	6.0	3.1	2.7	
6	3.0		5.0	2.0	2.7		
5			4.4	5.3			
4	2.0		1.5				
3							
2							

Examination of the scores of the two members of an interaction pair in BTA Groups on the quantity of contact between pairs as registered in observation records .

Each entry in the tables represents the mean amount of contact between pairs of group members with the particular paired scores as indicated by the position of the entry in the tables .

APPENDIX 11.18

Point Bi - Serial Correlation Coefficients : Inter - Decision Period Structure Questionnaire Responses with the Frequency of Interactive Episodes and Frequency of all Decision - making Categories in Episodes .

	Frequency of Interactive Episodes	Total number of decision - making categories per. 100 Episodes
All groups . Busy response Month seven	0.317	0.110
All Groups . Knowledge of what other members expected. Month one	0.034	-0.165
All groups . Knowledge of what other members expected. month 7	-0.049	0.276
All groups. Amount of feuding in groups . Month one	0.109	0.084
All groups. Amount of feuding in groups . Month seven	0.011	-0.153
Short course. Knowledge ofown tasks in exercise month one	-0.217	-0.018
Long course. Knowledge of own tasks in exercise . Month one	-0.193	0.178
Short course. Knowledge of own tasks in exercise. Month seven	-0.406	0.197
Long course. Knowledge of own tasks in exercise . Month seven	-0.255	0.006
Short course. Knowledge of others tasks in exercise . Month one	-0.031	0.344
Long course.Knowledge of others tasks in exercise.Month one	0.231	0.366
Short course.Knowledge of others tasks in exercise. Month seven	0.073	0.782
Long course.Knowledge of others tasks in the exercise.Month seven	-0.149	0.740

	Frequency of Interactive Episodes	Total number of decision - making categories per. 100 Episodes
Short course. General "morale" month one	0.006	-0.143
Long course. General "morale" month one	-0.051	0.210
Short course. General "morale" month seven	-0.111	0.065
Long course. General "morale" month seven	0.201	-0.137

Statistical significance of Correlation Coefficients

degrees of freedom (N - 2)	0.05	0.01	levels
16 ("All groups")	0.468	0.590	
7 ("Short" and "Long" groups)	0.666	0.798	

Contingency Tables of the numbers of total episodes recorded for every group member, classified as either Individual or Interactive, associated with numbers of tasks carried out by each group member.

Number of tasks carried out by each group member	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	21	22	23
11						1	1		1													
10												1			1							
9						1				1								1				
8					1	1		2	2	1			1									
7		1	1		3	1	2	1	1		4	1	1									
6	1		1	2	1	3	2	3	1	1	1	1	1		2		3	2			1	
5	1	1	4	2	1	5		3	3	4		2	1	1			1					
4	1			4	2	3	4	3	1	1	2	1					1					
3						2	4	1		2	1				1							
2		1					2	1	1			2			1							
1																						

Total number of Individual episodes noted for each group member

Number of tasks carried out by each group member	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	32	33	34	35	36	37
11																			1						1														
10									1					1																									
9					1											1				1																		
8													1			1			1		1	1			1		1								1			
7										1				2				1	2	5	2			1		1				1							
6			1					1		1			1	2			3	1	1	4	3	2	2	2		1		2							1			
5							1			1		1	1	1	2	1	2	4	2	2		2	3	2			1	2	1				1					
4							1				1				3	2	1		2	3	2		1		1	2			1		1						1
3								1							1	1		1	1			1		2	1			1				1					
2									1	1	1							1			1						1			1			1				
1																																					

Total number of Interactive episodes noted for each group member

Tests for significance of difference between means of the frequencies of interactive and individual episodes for two categories of group members carrying out different tasks (type A : tasks 1 2 3 4 but not 8 9 10 11 12 - type B : tasks 8 9 10 11 12 but not 1 2 3 4) .

Type A Tasks	Number of Interactive Episodes	Type B Tasks
1	37	
	36	
	35	
1	34	
2	33	
	32	
1	31	
	30	
2	29	
4	28	
3	27	
2	26	
2	25	1
3	24	2
4	23	2
3	22	2
4	21	1
10	20	2
3	19	2
4	18	
3	17	1
4	16	1
3	15	1
2	14	1
1	13	1
1	12	
1	11	
	10	2
	9	1
	8	2
1	7	
	6	
	5	
	4	
	3	1

	Mean Type A Tasks	Mean Type B Tasks	t - value
Interactive Episodes	21.14	16.74	3.07
Individual Episodes	7.23	13.26	7.64

df 87

Both these results are significant at beyond the 0.01 level of statistical significance .

Type A Tasks	Number of Individual Episodes	Type B Tasks
	23	1
	22	
	21	
	20	
	19	
1	18	1
	17	4
	16	
	15	4
	14	2
1	13	2
4	12	1
6	11	1
3	10	2
4	9	2
8	8	2
8	7	
10	6	
6	5	1
4	4	
4	3	
2	2	
3	1	

Tests for significance of difference between means of the frequencies of the various categories in the model of decision - making and control activity for two categories of group members carrying out different tasks (Type A : tasks 1 2 3 4 but not 8 9 10 11 12 - Type B : 8 9 10 11 12 but not 1 2 3 4) .

A. Interactive Episodes . (N is 66 and 23)

Decision Category	Mean Percentage Frequency Type A	Mean Percentage Frequency Type B	Level of sig. t-test
CP	14.3	10.0	0.01
SG	8.7	4.3	0.01
IA	28.0	23.6	0.01
IO	26.0	24.3	0.05
EO	20.1	18.2	0.05
CA	17.4	25.2	0.01
EA	18.6	23.4	0.01
S	1.3	4.1	0.05
D	6.2	6.1	-
SS	1.5	2.7	-

B. Individual Episodes . (N is 66 and 23)

Decision Category	Mean Percentage Frequency Type A	Mean Percentage Frequency Type B	Level of sig. t - test
CP	11.7	9.9	0.05
SG	3.1	3.2	-
LA	27.0	30.4	0.05
IO	25.7	24.2	-
EO	9.2	18.7	0.01
CA	10.5	12.3	-
EA	24.2	22.3	-
S	2.7	3.7	-
D	8.9	9.2	-
SS	-	-	-

APPENDIX 11.22

Rank Correlations between Group structure and frequencies of Group Decision and Control activities .

Table of Correlation Coefficients

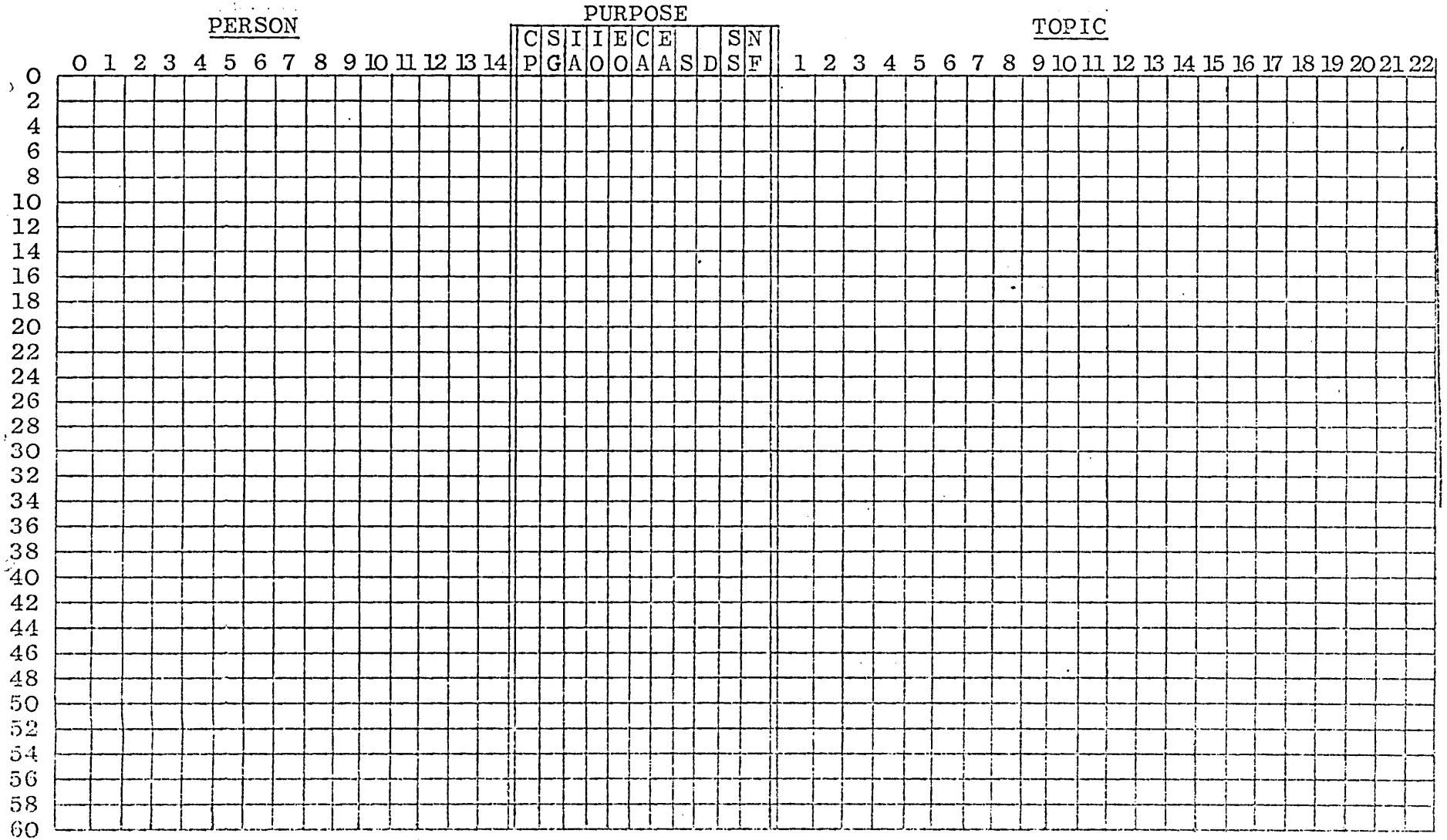
Decision-making and control category	Mean No. of tasks carried out by group members	Standard Deviation in tasks within groups	Characteristics of decision - making structure identified
C P	-0.15	0.11	0.05
I A	-0.28	-0.24	-0.01
I O	-0.09	-0.11	-0.23
E O	-0.25	0.11	-0.03
C A	0.28	0.21	0.10
E A	0.28	-0.05	-0.16
S G	-0.09	-0.12	0.20
S S	-0.27	-0.07	-0.23
S	0.14	-0.10	0.43'
D	0.01	0.22	0.24

df for all these coefficients is 22. The identified coefficient is significant at the 0.05 level . However a single significant result from chance alone would be expected from this series of correlations .

Management Group

Diary-Recording Form

Group Number ☐☐ Your Number ☐☐ Day Number ☐☐ Sheet Number ☐☐ Hour ☐☐



GROUP | | A

PERSON / NUMBER CODING FORM

MANAGERIAL GROUP PROJECT
PERSONNEL DEPARTMENT

PERSON		Dr. W.S.Barry	Dr. N.Blain	R.Coates	A.Grimes	Dr. K.Jackson	A.Jackson	DIARY KEEPER D.Kitchen	D.Lowe	R Mortimer	S.Tribe	E.Abeles	
NUMBER	0	1	2	3	4	5	6	7	8	9	10	11	12

EPISODE CLASSIFICATIONS

CP	SG	IA	IO	EO	CA	EA	S	D	SS	NF
Clarifying Problem	Setting Goals	Identifying Action	Identifying Outcome	Evaluating Outcome	Choosing Action	Effecting Action	Sensing	Discriminating	Setting Standards	Non-Functional

ACTIVITY LIST / NUMBER CODING

ACTIVITY	Making policy on Personnel Development	Making Plans for Personnel Changes	Conducting Training Courses	Develop. Training Courses	Collecting Personnel Data	Analysis Personnel Data	Constrctng Selection Measures	Evaltng. Predictns of Measures	Carry out Research Studies in Persnl. Topis	Adminstg. Selection Boards	Interview Candidates	Committees	Investi- gate oth companies Personnel Practices
NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13

ACTIVITY	Evaluating Training Equipment	Preparing Reports for Publication	Public Lecturing	Designing Experiment	Running Experiment	Biblio - graphic Studies							
NUMBER	14	15	16	17	18	19	20	21	22	23	24	25	26

Results of Trial of the Diary - Recording Instrument

A total of 16 episodes were recorded . The length of the episodes was as follows :

Time (minutes)	0 - 1	1 - 2	2 - 5	5 -10	10-15	15-30	30-60	60 +
No. of Episodes	0	0	2	6	3	1	2	2

Pattern of Activity

1. With whom Interaction took place

Person / Number code	0	1	2	3	4	5	6	7	8	9	10	11
Frequency of episodes	11	0	0	1	1	1	0	0	0	0	2	0

2. Classification of Episodes using the Model of Decision-Manking and Contr

Categories	Clarrifying Problem	Setting Goals	Identifying Acti
Frequency	7	1	7

Categories	Identifying Outcome	Evaluating Outcome	Choose Action
Frequency	2	6	6

Categories	Effecting Action	Sensing	Discriminating
Frequency	1	0	1

Categories	Setting Standards	Non - Functional
Frequency	3	0

3. Topics of Episodes

Number Code	1	2	3	4	5	6	7	8	9	10	11.	12	13	14	15	16	17
Episode Frequency	0	1	0	3	0	1	1	0	0	1	0	1	0	0	3	0	2

APPENDIX 12.4

MANAGERIAL GROUP PROJECT

PERSONNEL DEPARTMENT APRIL 1968

Coding Systems

To facilitate the recording of data both for you and the researcher a code system is suggested for the study. Number codes will be produced both for the people with whom you communicate and the specific topic of any communication with any individual. Eventually, as an example, you will always record R F Jones, Manager, Selection Services, by the number 3 and the topic of selection itself by number 5. The way in which codes are produced for your group is given later. This use of codes will also help to preserve anonymity.

The suggested person/number code for your group is included below. The allocation of numbers has been done alphabetically. During the study you will indicate these people by the use of the number opposite the name.

NAME	TITLE	NUMBER
		1
		2
		3
		4
		5
		6
		7
		8
		9
		10
		11
		12
		13
		14
		15
		16

Before the Structure Questionnaire is given out we would like you to try to identify the specific work activities with which the people in this list are concerned. From the lists of each group a new list will be constructed which best represents the opinions of each group. This second list will be issued for use as a coding device - in a similar way to the person/number list on the previous page.

The list of activities which we would like given is rather more detailed than that which could be obtained from the examination of the job titles of each group member. Even a Job or Role description, or list of duties for each staff member may be inadequate, as someone in your group may be doing a project, perhaps, which was conceived after the original job specification was drawn up. To some extent, all events within your group are unique - the division of activities we want is somewhere between this and the title of your branch. We would like this list of recognisable and distinct activities not to exceed twenty in number. Could you please fill in and detach the list below.

List of Group Activities Group No ☐☐ Your No ☐☐

Number	Description of Activity
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	

Structure Questionnaire

The introduction for each individual question in the Structure Questionnaire contains enough material and descriptive examples for you to be able to complete the questionnaire without assistance. The only complication is that you are asked to use the code numbers developed for both the person and particular topic you may be recording in the answers.

Diary Recording Form

In the diary recording form, use is made, not only of the person and topic coding, but also of a classification of the purpose of each episode. This entails, unfortunately, a rather long explanation. In practice, however, you should find the scheme no more cumbersone than the previously discussed coding systems.

Each diary recording sheet represents one hour. Which hour it is, to which group you belong, your own number within that group and the number of the sheet is entered on the top line of the form. The numbers going down the left-hand side of the table on each page are the component 60 minutes within that particular hour. Each division therefore represents two minutes. This does not mean that an entry has to be made on each line every two minutes - only when there is a change in the activity with which you are concerned does an entry have to be made on the form. You fill in only those lines which happen to correspond with the time that you change what you are doing; obviously if an episode lasts less than two minutes you do not bother to record it.

What constitutes a change of episode? In this scheme we would like you to make an entry on the sheet when:

1 The people involved in an activity change
(example, somebody rings you or Jones leaves your office)

OR

2 The topic of an episode changes
(example, the conversation suddenly switches from Personnel changes to Production difficulties)

An extended example later will show possible episode changes.

What is actually recorded when a new episode is begun? Three items of information - these are:-

1 The details of the people taking part in the episode. The code already outlined will be used here.

2 The purpose of each particular episode. This is explained towards the end of this booklet.

3 The topic of each episode. A code for this classification

will be developed from the list of activities you will have written earlier and a concensus list will be issued for your use during both the questionnaire and diary completion.

The information recorded when a new episode is started refers to the episode just completed.

The left-hand third of the table is used for the registering of the people who are concerned in the episode. The numbers 1 to 14 refer to the members of your group (not all the numbers may be used in your group) and the 0 represents anyone who is not within your group. If the episode involves someone in your group - but who does not have a number (a secretary, clerk, etc, for example) - could you put a circle instead of a cross or tick in the number column which corresponds to the person in the group to whom the person, without a number, reports. The example below shows most possible variations.

Your Number | 0 | 8 |

Hour | 1 | 0 |

PERSON

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
0															
2									✓o			✓			
4															
6															
8	✓o								✓						
10															
12															
14					✓	o			✓						
16															

etc

At 1002 an episode was completed (details of when this episode was begun are on a previous page). This episode involved (in terms of immediate written or spoken communication) a junior responsible to the diary recorder himself and member 11 of the group. When this finished at 1002 a new episode concerning the recorder with somebody outside the group was begun and continued until 1008. From 1008 until 1014 an episode took place involving member 4 of the group together with the recorder and a person who reports to member 5.

The right-hand side of the recording form refers to the specific topic of each episode. The numbers from 1 to 22 will cover all the activities with which your group is involved. One box should be 'ticked' for each episode. A change in the topic would mean a new episode. The entry on this side of the form will be on exactly the same line as the data for the people involved in the same episode.

Example:

	PERSON											PURPOSE	TOPIC									
	0	1	2	3	4	5	6	7	8	9	etc		1	2	3	4	5	6	7	8	9	etc
14						✓									✓							
20	✓					✓											✓					

An episode which was completed at 14 minutes past the hour was concerned with topic 3 - only the recorder was involved. An episode begun then and finished at 20 minutes past the hour involved someone outside the group and was about topic number 5.

The third item of information recorded for each episode, the purpose of each episode, is placed in the centre of the form. A total of eleven categories of purposes of episodes are recognised. The choice for this particular classification is quite arbitrary and is based on the two concepts of basic managerial function - decision-making and control. Each initial on the recording form stands for a purpose category within this classification:-

CP	Clarifying Problem	Decision Making
SG	Selecting Goals	
IA	Identifying Action	
IO	Identifying Outcome	
EO	Evaluating Outcome	
CA	Choosing Action	
EA	Effecting Action	
SS	Setting Standards	Control
D	Discriminating	
S	Sensing	
NF	Non-Function	

A particular episode may be directed towards any number of the purposes. You are requested to tick those appropriate in the same line as for the first two items.

Example:

	0	1	2	3	4	5	6	7	etc	C P	S G	I A	I O	etc	1	2	3	4	5	6	7	8	etc
24		✓			✓							✓	✓							✓			

Group member 4 (the recorder) working with group member 1 has just completed an episode at 24 minutes past an hour. The episode was concerned with topic 6 and it was directed towards Identifying Action (IA) and Identifying Outcome (IO).

Finally, in this booklet, is a further description of the purpose episodes just given. It is very important that you manage to get through this rather difficult section. All the effort made now will mean that you do not have to spend long thinking about each episode in detail during actual recording! If you have any queries the researcher would be glad to answer them.

Clarifying Problem

Any episode concerned with any topic is classified as being taken up with 'clarifying problem' if any part of the particular episode is directed towards finding out the nature of the problem. It doesn't cover the finding of a solution - only the identification of the main framework of the problem which confronts the person(s). Often the nature of a particular problem may have become clear by the time you are presented with it - you may, for instance, just be set the task of solving a well-known problem.

Setting Goals

For some activities in which you become involved there may be specific goals set. Examples of goals are the achievement of a certain revenue or load factor on a specific route (as a major organisational goal) and the successful recruitment of a new member of staff to fill a vacancy (as a goal likely to be affecting only small parts of the organisation at a particular time). The episode during which the revenue is set or when the decision to aim at recruiting new staff during the next six months would be recorded as a setting goal episode.

Identifying Action

This category is the identification and enumeration of the various actions which could be taken relating to a particular topic (this may often be a problem about which a decision will have to be taken). There may be, on occasions, only one possible action but usually there will be at least several possibilities. We are not interested in the actual process of choosing between these possibilities in this category - only noting what actions could be taken. The possible actions in the recruitment example might be internal promotion, staff vacancy notice, local advertising, national advertising or direct approach to someone who has expressed his interest in future vacancies. An episode in which the person was listing these possibilities by himself - or was discussing the possibilities of action with someone else (in this case perhaps a Personnel Officer) would be an 'identifying action episode'.

Identifying Outcome

This often follows very closely from the last episode category. Once the various actions have been listed the standard way towards making a choice is first to consider what would be the likely outcome of each of the actions. In the example we are using, the outcome of internal promotion might be to create a new (difficult to fill?) vacancy: the use of a staff vacancy notice only may not get enough good applicants: local advertising may also not get enough good applicants: national advertising may produce too many applicants and prove too costly. It is not choosing between the outcomes as to which is preferred - it is only the actual finding out what the results of taking possible actions would be.

Evaluating Outcome

Evaluating outcome is the comparison of the various possible outcomes of action to see which outcome is most likely to meet the goal which has been set concerning this particular activity. In the recruitment policy problem, the evaluating outcome is the comparison of the relative merits of the results of internal promotion, staff vacancy notice, etc, (high cost, low cost, convenience, secondary recruitment problem, low response, high response). This episode often occurs at the same time as the identifying of outcome. Similarly, identification of action occurs frequently in conjunction with the identification of outcome.

Choosing Action

By this we mean the actual selection of one possible course of action based on the evaluation of the possible outcomes of that action.

This activity is the same as making a decision - although it is limited only to the moment when one action is chosen out of several alternatives. In the example we have been using, it might be the decision to promote internally rather than to advertise externally. Occasionally it may not be so much a positive selection as an elimination of actions which are seen to be unacceptable in their outcomes. This activity usually follows the activities just described (identifying action, outcome, etc) but occasionally it may be quite separate. For example, a meeting may be convened to make the decision - although the possible outcomes of actions have already been identified and evaluated.

Effecting Action

Effecting action is the actual putting into operation of an action decided upon. It may mean that a decision is written down or communicated to somebody else in the organisation. On the other hand the whole action may be carried out by the person filling the diary. Two examples which show possible extreme cases are the sending of a single memo which implicitly contains the action decided upon and, say, the physical loading of an aircraft: both these activities are the carrying out of an action that has been decided upon. Effecting action is therefore the purpose of any activity which results in an action being carried out.

Setting Standards

This activity is nearly identical to the activity of setting goals. The difference is that the setting of standards is an activity which provides one with a measure of how one has done in relation to a specific problem at some time in the future when the problem is in the process of being (or just been) tackled. The setting of goals refers to how well one hopes to do at the moment of choosing action (that is, before action is effected). Thus the setting of goals is an aid to the making of decisions about what decisions should be taken - the setting of standards is an aid to finding out how effective the action has been. The setting of standards often takes place at the same time that goals are set and may, in practice, be identical with setting goals: in such a case both categories would be recorded for the relevant episode.

Sensing

This particular activity is looking at or looking for information about how a particular action is being carried out or a particular result achieved. It does not include the assessment of how well the action is being carried out or the result is being achieved. If, for example, a manager phoned to find out if a particular action was being carried out - then this would be a sensing activity: but if the manager at the same time made comments as to how effective this action was - then other purpose categories should be recorded on the diary form in addition to that of sensing. Other examples of a manager sensing might be the examination of the punctuality record for a particular month or even just looking through a window to make sure that an aircraft was being loaded.

Discriminating

This activity is very often closely connected with the previous activity (rather in the same way that identifying outcome and evaluating outcome often take place in the same episode). It is the comparison of seen action and result compared with the expected or desired action and result. It can often be recognised by the use of set standards to compare the actual actions and results with those that were hoped for.

For example, if the manager compared the results of operations (in terms of punctuality) with the forecasted results - this would be a discriminating activity. In this case a previously set standard would be used (perhaps only 5% of departures were to be later than 20 minutes).

This concludes the list of activity categories except for the activity which is taken to be in force when none of these activities is applicable. This includes such episodes as personal and private telephone calls, talking to fellow managers about matters not connected with BEA, or drinking coffee. These episodes are identified by the activity category NON-FUNCTIONAL.

MANAGERIAL GROUP PROJECT
PERSONNEL DEPARTMENT APRIL 1968

You are being asked to take part in a short study conducted under the auspices of the Personnel Research and Development Branch within the Personnel Department. It is intended to use some of the general results obtained from the study for the development of future policies about personnel Planning and Development for the whole Corporation. The study is being carried out by a member of the Management Research Department at Imperial College, London, and who is not a member of BEA's staff. Much of the material he will be obtaining will be used for the writing of a thesis for a higher degree. Any findings he makes available to BEA will be completely anonymous and will not refer specifically to any of the groups of managers, superintendents, etc, he will have studied.

Several working groups within each of the main areas of BEA are being asked to participate in the study in order to cover as wide a range of Corporation activity as possible.

The specific aims of the study can be summarised as follows:-

1 to identify patterns of communications between the members of each of the selected managerial groups.

2 to find out exactly how work activities and decision-making are shared out between the members of the group.

3. to compare the working of the group with groups which are used for training purposes (especially in BEA Management Games).

Example of the actual size of all questionnaires used in the Management Group Project

MANAGERIAL GROUP PROJECT
PERSONNEL DEPARTMENT APRIL 1968

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2 to find out exactly how work activities and decision-making are shared out between the members of the group.

3 to compare the working of the group with groups which are used for training purposes (especially in BEA Management Games).

The Study will last approximately two weeks for each managerial group that agrees to take part. During this period your active assistance will only be required for a week. The methods to be used by the researcher to obtain data are:-

1 An initial short interview with each member of the group. This will enable the researcher to answer any queries concerning the study which are still outstanding after an explanatory booklet has been issued. In addition he will attempt to obtain a general idea of the function of the member within the studied group.

2 A short questionnaire will be given out at this first meeting which will ask each group member to identify, in detail, the kinds of activity with which he is normally concerned.

3 During one week you will be asked to complete simple diary sheets. These sheets will record - the people with whom you communicate - the topic of every episode and the purpose of each episode. It is estimated that the completion of this recording system will require only a few seconds every five minutes.

4 During this week the researcher will be spending a short time (perhaps a morning or an afternoon - whichever is convenient for the particular member) observing each of the members of the group working.

A more complete booklet giving a breakdown of each method in detail will be distributed later. The study will only be carried out in your group if all people approached agree to take part.

MANAGERIAL GROUP PROJECT

PERSONNEL DEPARTMENT APRIL 1968

STRUCTURE QUESTIONNAIRE

You are asked to fill up this questionnaire without conferring with your colleagues. It is realised that the answers to some questions may not be completely correct because of this.

IT IS YOUR IMPRESSIONS OF ALLOCATION OF ACTIVITIES, ETC, RATHER THAN A DEFINITE PICTURE WHICH IS SOUGHT.

This questionnaire is very similar to one used to examine the organisational structure of teams which take part in the BEA Business Exercise (BTA). If you have recently taken part in a BMS or AMS course, or InterAirline Game, the format will be quite familiar to you.

We are asking you to identify certain aspects of structure which are not always apparent from an examination of the formal organisational definition of duties and responsibilities and the rigid organisation hierarchy of authority.

Question One

Please identify your 'group' number ☐☐

Question Two

Please identify your number within the group ☐☐

Question Three

Have you found completing the diary:-

Very Interesting	Interesting	Quite Interesting	Not Interesting	Tedious	Very Tedious
☐	☐	☐	☐	☐	☐

Question Four

Has completing the questionnaire added to your normal workload:-

Very Considerably	Considerably	Quite a lot	A Little	Hardly at All	Not at All
☐	☐	☐	☐	☐	☐

Questions five, six and seven are longer and require some concentration. You are requested to read the introduction and the examples given with some care.

Question Five

At the end of this section is a blank grid which we would like you to complete by identifying which people were engaged (in any way) with which activities. It is recognised that:-

i) certain activities may be shared between a large number of people

and ii) the classification of activities may not be the one which you think is most useful.

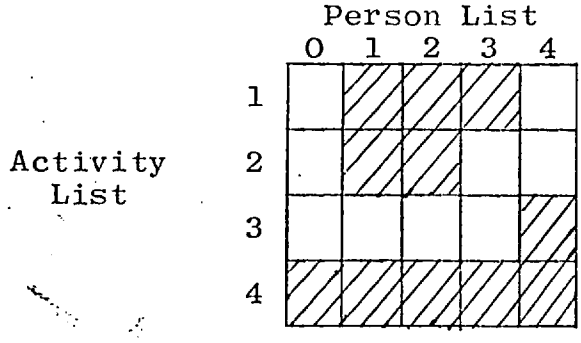
The illustrative example below should help to explain what is requested.

Activity List	No
ABC Promotion Campaign	1
XYZ Promotion Campaign	2
Window Display Design	3
IT Booklet Design	4

Person List	No
Smith	1
Jones	2
Evans	3
King	4

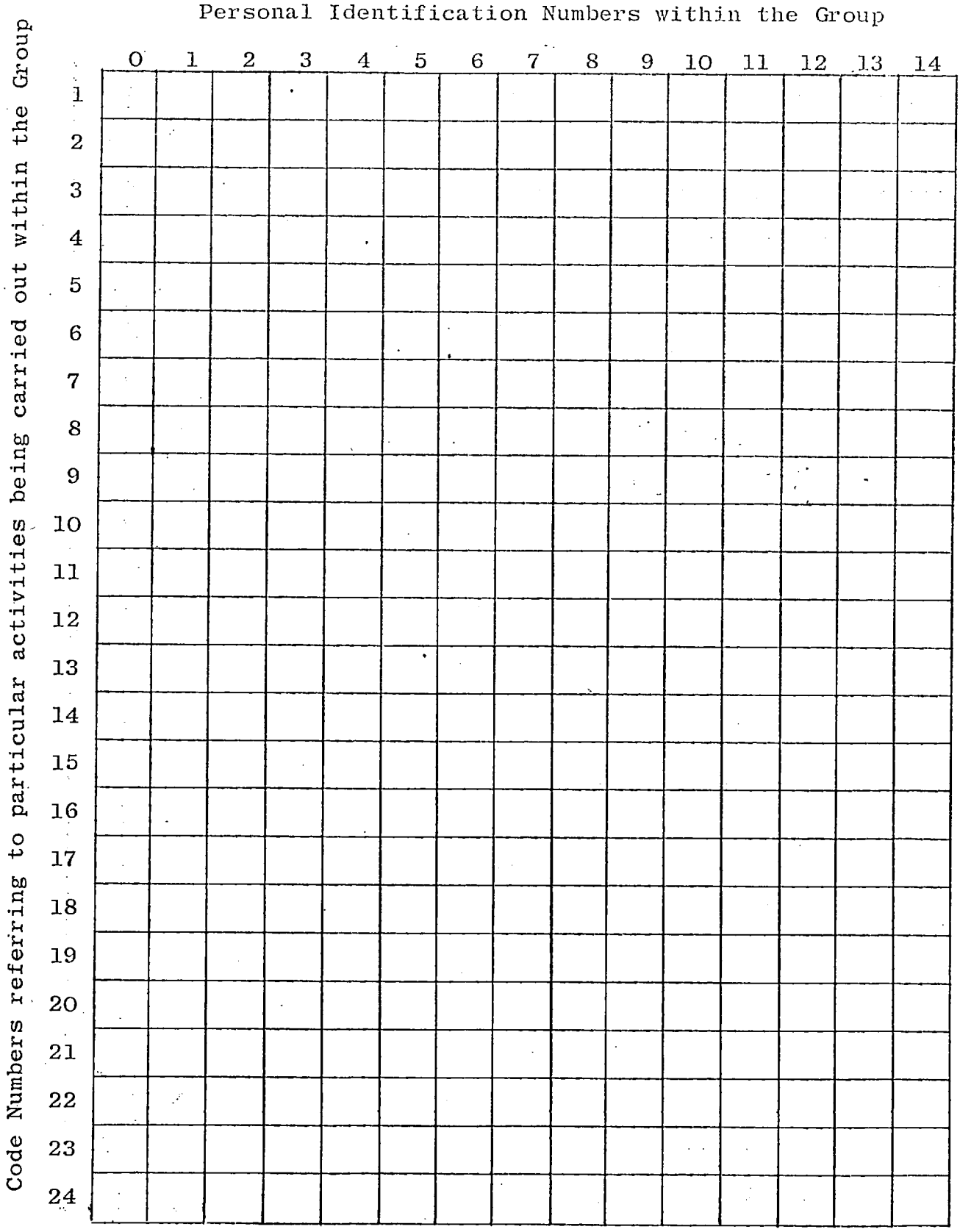
Jones is in charge of the XYZ Promotion Campaign but decisions about aspects of the campaign are made in conjunction with Smith. Evans is similarly in charge of the ABC Sales Promotion but in making decisions he has to consult both Smith and Jones. King does all the work for the window display design by himself and is allowed to make his own decisions about it. All four people coordinate (through a working committee in this case) in the production of an IT Booklet, although decisions about this are made by people outside this working group.

The grid for this group would be:-



Now please attempt to do the same for your own group - by filling in the blank grid. Draw a single line through any person or activity which is not present in your group. Remember that 0 refers to anyone outside your individual group.

3


Personal Identification Numbers within the Group
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14
Code Numbers referring to particular activities being carried out within the Group
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

Question Six

This question follows on from question five. We would like you to say, for all the activities in your group, whether your group's function in relation to each of the separate activities is:-

i) to supply information (in any form) to another part of the organisation only.

ii) to actually make decisions about the particular activity.

OR iii) to supply information to other parts of the organisation or sometimes to make decisions relating to this specific activity depending on the specific occasion.

It is expected that all activities can be classified into these types and we would like you to tick whichever box you think most appropriate for each activity. If you found the classification difficult could you give a brief explanation in the space provided at the bottom of the table.

Code numbers referring to particular activities being carried out within the Group	Supplies Information to another part of the organisation only	Makes Decisions concerning the particular activity	Supplies Information OR Makes Decisions
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
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14			
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24			

Question Seven

In this question we would like you to think closely about the actual making of decisions within each of the activity categories.

How are the decisions concerning the various categories of activities within your group made? Are decisions made:-

1 By people within your group and who you have identified as being involved with the particular activity in question five.

OR 2 By people who are not members of the particular group with which you are concerned.

OR 3 By a mixture of people - some of whom are in your group but others are outside. This coordination of decision-making between people in separate groups might be accomplished through usual communication channels or through the work of a committee or other similar body meeting outside the confines of the formal organisation structure.

For an affirmative answer in categories 1 or 3 could you please specify (by number code) which members of your group were involved.

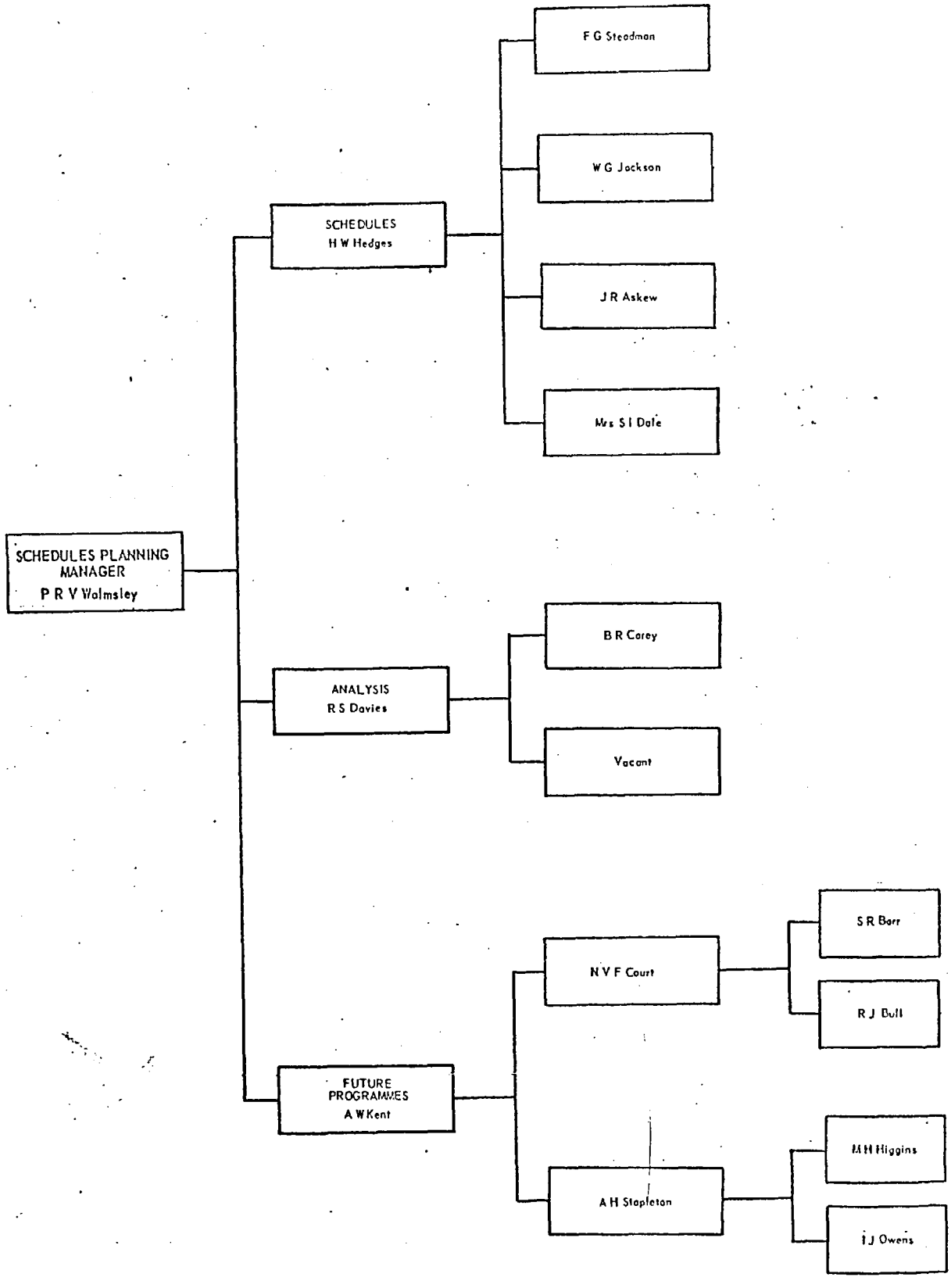
YOU SHOULD TICK ONLY ONE OF THE DECISION TYPES FOR EACH SEPARATE ACTIVITY

Code numbers referring to particular activities being carried out in the group	Decisions are made by the people who you have identified as being involved with the activity in question five	Decisions are made by people who are not members of your working group	Decisions are made by a combination of people from inside and outside your group
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
	Please tick if appropriate AND give the code numbers of the particular people who are involved in making the decision	Please tick if appropriate	Please tick if you agree and give the code numbers of the people involved who are in your group

BEA ORGANISATION

SCHEDULES PLANNING

Ref C/11
Issue 1
Date 1 Jun 1968



None of the Management Groups implicit in this example of BEA's Organisation Structure were used during the study .

FROM Manager, Personnel
Research & Development
Douglas House

24 May 1968

TO Chief Cashier

cc GMPP&D

MANAGERIAL GROUP PROJECT : PERSONNEL RESEARCH

Mr S Tribe, a member of the Management Studies Department of Imperial College, is carrying out research in BEA sponsored by a BEA Personnel Research Fellowship. The research is concerned with the description and analysis of patterns of management communication and decision-making and how these relate to the tasks in hand. With this in view Mr Tribe has identified about 10 groups of staff usually headed by a manager and comprising up to 11 people at superintendent or officer level, who could comprise the research sample.

I am writing therefore to ask you whether you would be willing, together with some or all of M Scale staff who report to you to form one of the groups and participate in the project.

The attached note gives some detail of the approach we want to take and Mr Tribe is ready to give more detail and describe the short questionnaires and diary forms, when convenient to you.

You will see that the study requires the completion of 2 questionnaires followed by an unobtrusive recording by each member of the group of his activities and communications in a period of one week.

I am sure that should you be willing to participate the requirements would occupy you and your staff for a minimum of time, and, I think, you might find it a useful exercise.

Please let me have your views as soon as convenient.

David Kitchen

Lists of Group Tasks[1] used in section three of Diary Recording

1. Baggage Claims
2. Air Cargo Claims
3. General Claims (other than categories 1 and 2)
4. College of Air Training
5. BEA Helicopters
6. Silver Wing Club
7. Staff Motor
8. Staff General
9. M T Cover and Claims
10. Employer Liability and Staff Claims
11. Fire Insurance
12. Transactions of Insurance
13. Credit Approval Claims
14. Fly / Drive Claims
15. General Insurance
16. Personnel

1. Sales Publications
2. Educational and Inaugeral Flights
3. Executive Club
4. Tariffs
5. Credit Schemes
6. Business Travel
7. Interline tours
8. Hotel Development
9. Other
10. Staff Matters
11. Air / Road Services
12. Staff Incentive Scheme

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1. This list includes both groups actually used as well as groups which were not able to take part in the diary - recording exercise .

1. Housing Casework and Advice
2. Legal / legislative C & A
3. Hospital , Sickness , Convalescence . Schemes and Visits
4. Educational Case Work and Advice
5. Domestic Family Casework and Advice
6. Ex Gratia Payment . Casework and Committee work
7. Retired Staff
8. Duty Domestic Travel
9. Duty International Travel
10. Concessional Domestic Travel
11. Concessional International Travel
12. Other Carrier Travel . Duty and Concessional
13. Computerisation of Staff Records
14. Personnel Statistics
15. Staff Recruiting . SVN and Ad Hoc .
16. Staff Recruiting . External
17. Careers Publications and Local Authorities
18. Personnel Publications
19. Pension Matters
20. Personnel Administration
21. Suggestion Scheme
22. Other

1. International Complaints (ground)
2. International Complaints (air)
3. Domestic Complaints (ground)
4. Domestic Complaints (air)
5. International Claim (ground)
6. International Claim (air)
7. Domestic Claim (ground)
8. Domestic Claim (air)
9. Compliments to BEA (ground)
10. Compliments to BEA (air)

1. Advertising and Displays
2. Long Term Sales Development
3. Current Sales
4. Short Term Sales Development
5. Equipment Specification
6. Systems Revision
7. Customer Relations
8. Quality Control
9. Editorial : Books and Pamphlets
10. Training
11. Cargo Methods
12. Terminal Projects
13. Cargo Container Developments.
14. Handling Equipment
15. Sales Advisory
16. Commodity Studies
17. Sales Liason
18. Agency Appointments
19. Cargo Procedure Policy Administration
20. Government , I A T A Carriers , Liason
21. Personnel Matters
22. Other

1. Course Administration
2. ASRS , PALC and PALA (various computer packages dealing with operation
3. Reservation Systems
4. Passenger Service Systems
5. Pricing and Documentation
6. Service Attitude
7. Product Knowledge
8. Communication Techniques
9. Air Transport Background
10. Selling Attitudes
11. Selling Techniques
12. Inter Division Training
13. BEA Communication Systems
14. Interline and Agents Training
15. Audio / Visual Equipment
16. Training Validation

17. Personnel
18. On - Site Training
19. Trainee Administration and Accomodation
20. General Training Research and Development
21. Long Term Section Activities and Planning
22. Other

1. Regional : General
2. Regional : Estimates
3. Regional : Loading
4. Regional : Agreements
5. Regional : Results
6. Regional : Costs
7. Schedules Planning : Short Term
8. Schedules Planning : Long Term
9. Schedules Planning : Aircraft
10. Schedule Changes
11. Cargo Terminal Handling BEA
12. Cargo Terminal Handling Other Carriers
13. Cargo Terminal Schedules
14. Training and Other
15. Commodity Rates
16. Rate Developments
17. Conference Matters (Tariffs)
18. Other Carriers ; Estimates
19. Other Carriers : Schedules
20. Other Carriers : Long Term
21. Overseas Areas Schedules
22. Overseas Areas Developments
23. Overseas Areas Estimates

Summary Results of Diary Recording .

This appendix contains the summary results of all diary recording carried out by the members of the management groups studied within British European Airways .

The first page for each group gives this summary . The The standard form used for these pages allows a total of 14 group members to be included , and up to 22 group tasks to be differentiated . The various categories in the decision-making and control model are specified .

The second page illustrates the detailed recorded total interaction between particular members of each group . Included are members of the group who did not actually keep diary records . The total contact of each group member (who kept a diary) with persons outside the management group is also given .

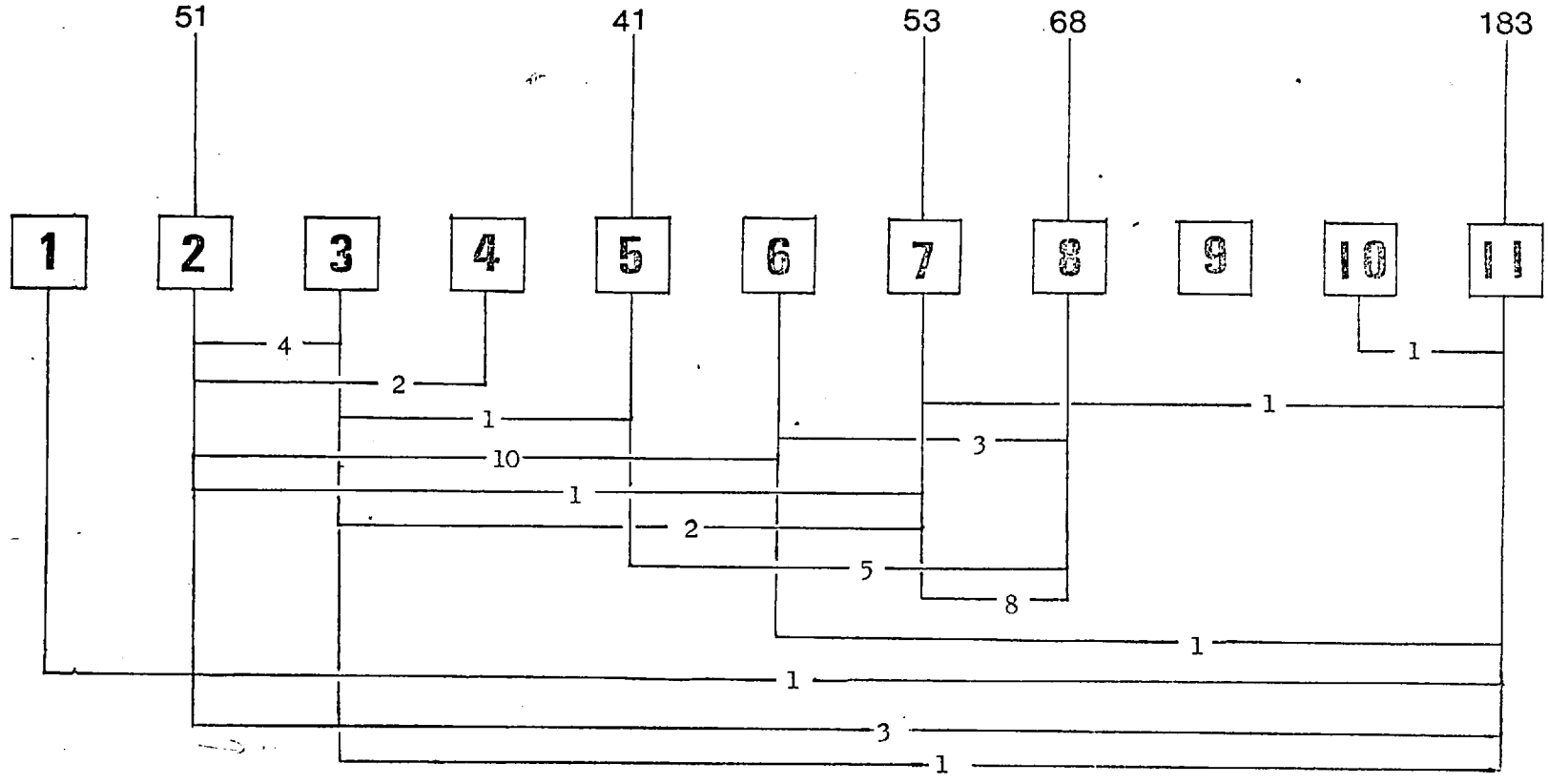
Group Number

0 1

22		17			44		21	27			34						
21		05															
20		28															
19		02															
18		46															
17		06															
16		25															
15		29															
14		02															
13																	
12											36						
11		04					03				40						
10		02					04				11						
9							02				120						
8											14						
7		06			15		14				01						
6							04	12									
5							13	14									
4							05	04									
3					53		14	17									
2					01			13									
1					02		13	27									

Non-functional		08					12	19			12						
Setting Standards		01					02										
Descriminating							08										
Sensing		22			02		07	04									
Effect Action		53			66		26	60			138						
Choose Action		49			09		14	45			49						
Evaluate Outcome		12					09	04			10						
Indentifying Outcome		20					08				24						
Indentify Action		49			11		15	32			61						
Setting Goals		01			05		23				01						
Clarrifying Problem		32			34		22	34			83						

14							01										
13																	
12																	
11		01					01				276						
10											01						
9																	
8					05		08	119									
7		01					110	04			01						
6		10						03			01						
5					99			04									
4		02															
3		04			01		02				01						
2		126									03						
1											01						
0		51			41		53	68			183						



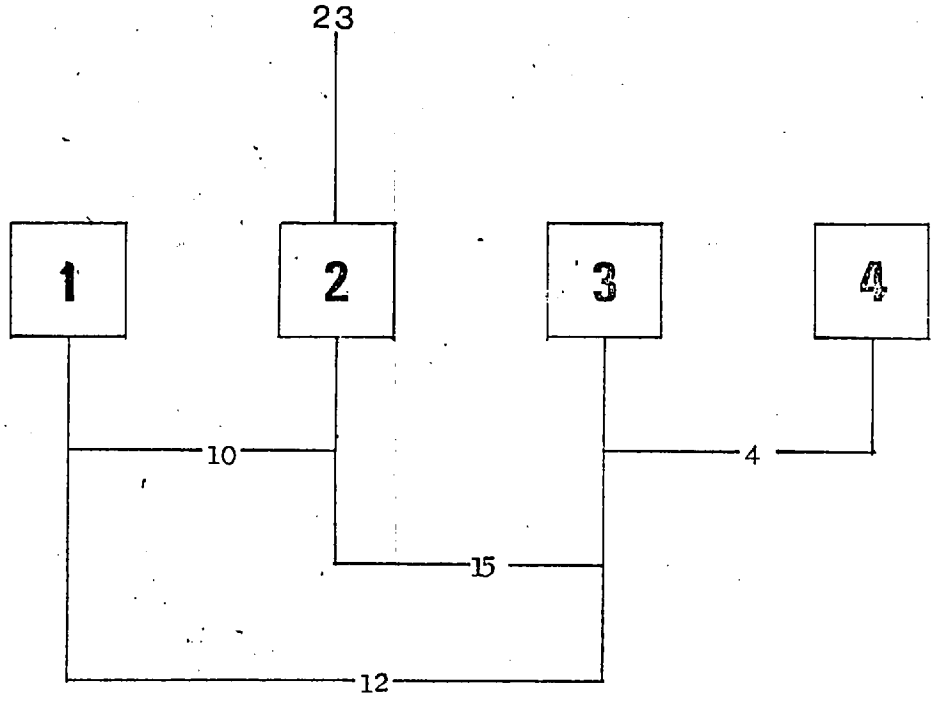
group 01

Group Number
0 2

21		
20	01	08
19	05	22
18		
17		
16		
15	01	
14		
13	02	
12		
11	05	
10	23	06
9		
8	02	
7		
6	01	
5	03	
4	05	01
3	15	03
2		13
1	16	19

Non-functional	06	24
Setting Standards	09	
Descriminating		
Sensing	19	24
Effect Action	38	51
Choose Action	25	20
Evaluate Outcome		
Indentifying Outcome	04	
Indentify Action	02	20
Setting Goals		
Clarrifying Problem	04	28

14		
13		
12		
11		
10		
9		
8		
7		
6		
5		
4		04
3		111
2	76	15
1	10	12
0	23	



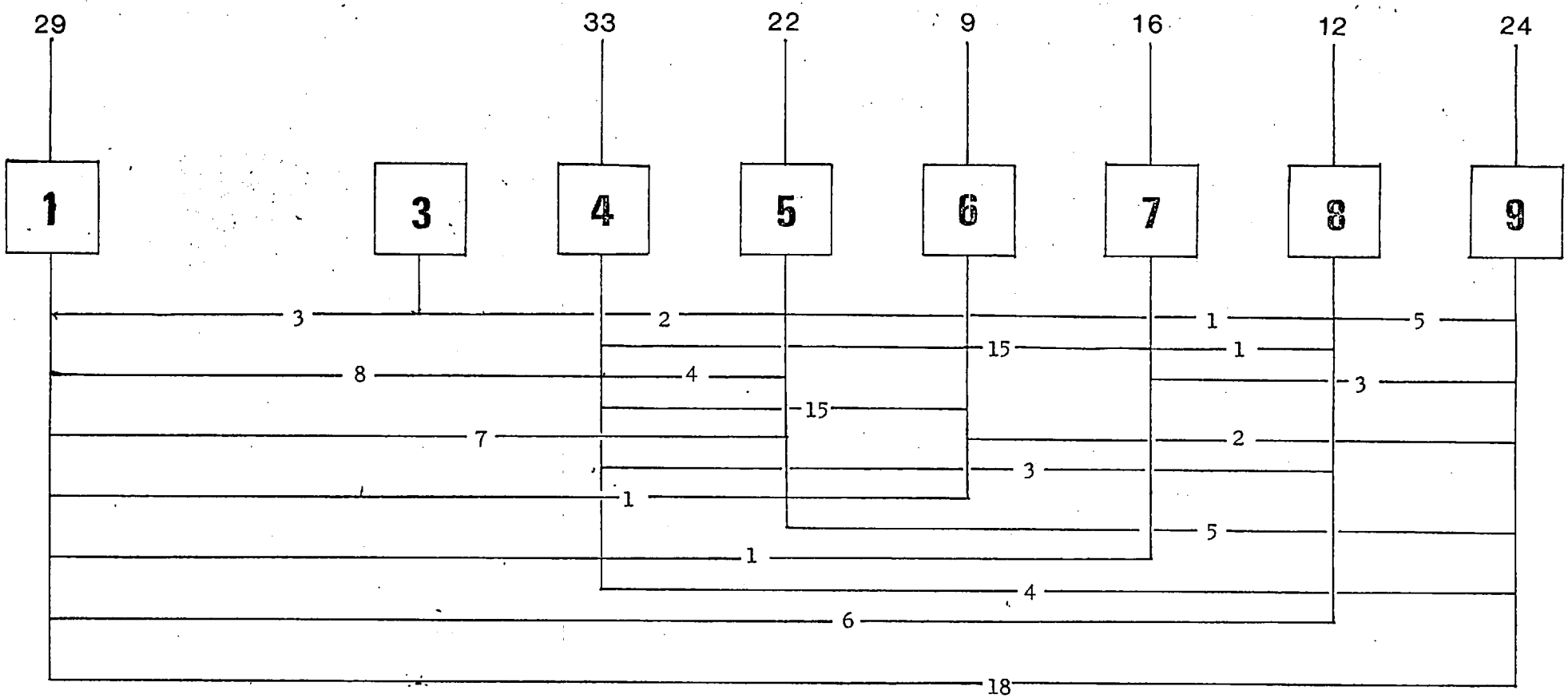
GROUP 0.2

Group Number
03

22									
21									
20	11		54	26	20	22			
19									
18									
17									
16									
15									
14	02								
13	10		05					01	
12								12	
11	12							16	
10	02								
9	01		01	03	01	01			
8	02		01		05			10	
7	02		04		08	01		13	
6	04		05	41	15	03	11	12	
5	03		05	22	02		10	17	
4			07		06			15 14	
3	07		16	06	17		01	61 27	
2	08		08	26	03	15	18	13 12	
1	15		11	41	52	15	25	44 43	

Non-functional	11		10	37	31	06	11	45 01
Setting Standards	02			02				01 02
Descriminating				07	03	06	01	27 03
Sensing				19	11	05	04	24 10
Effect Action	21		67	35	49	18	13	42 45
Choose Action	19		01	24	33	10	03	11 32
Evaluate Outcome	02					02		02 10
Indentifying Outcome	02					03		05
Indentify Action	14			06	05	07	05	26 43
Setting Goals							06	02
Clarrifying Problem	40		15	36	39	20	14	35 87

14								
13								
12								
11								
10								
9	18			04	05		05	114
8	03			01	01		161	02
7	01			15		53	01	03
6	01			15		51		02
5	07			03	118		01	05
4	08			160	04		03	03
3	03		98		02		01	
2								
1	88		01	05	02		06	07
0	29			33	22	09	16 12	24



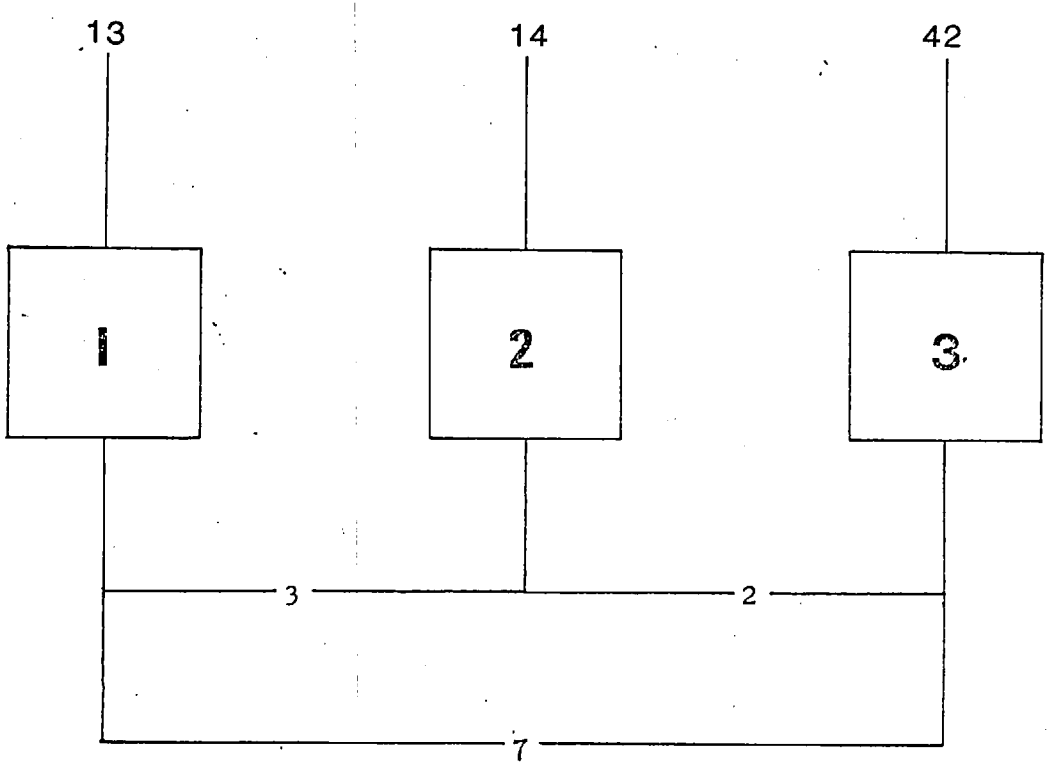
group 03

Group Number
0 4

21			02
20	01		01
19			03
18		01	
17	03		06
16			05
15			04
14	02		08
13			01
12			
11			05
10	01		02
9			
8			05
7			02
6			08
5	04		04
4			03
3	09	02	04
2	21	17	05
1	03	04	05

Non-functional	08	06	
Setting Standards			05
Descriminating	01		05
Sensing		05	07
Effect Action	20	01	04
Choose Action	06	14	12
Evaluate Outcome	02		03
Indentifying Outcome	02		01
Indentify Action	01	01	09
Setting Goals	03		11
Clarrifying Problem	10	02	16

14			
13			
12			
11			
10			
9			
8			
7			
6			
5			
4			
3	07	02	76
2	03	29	01
1	51		03
0	13	14	42



group 04

Group Number
0 5

21				
20				
19				
18				
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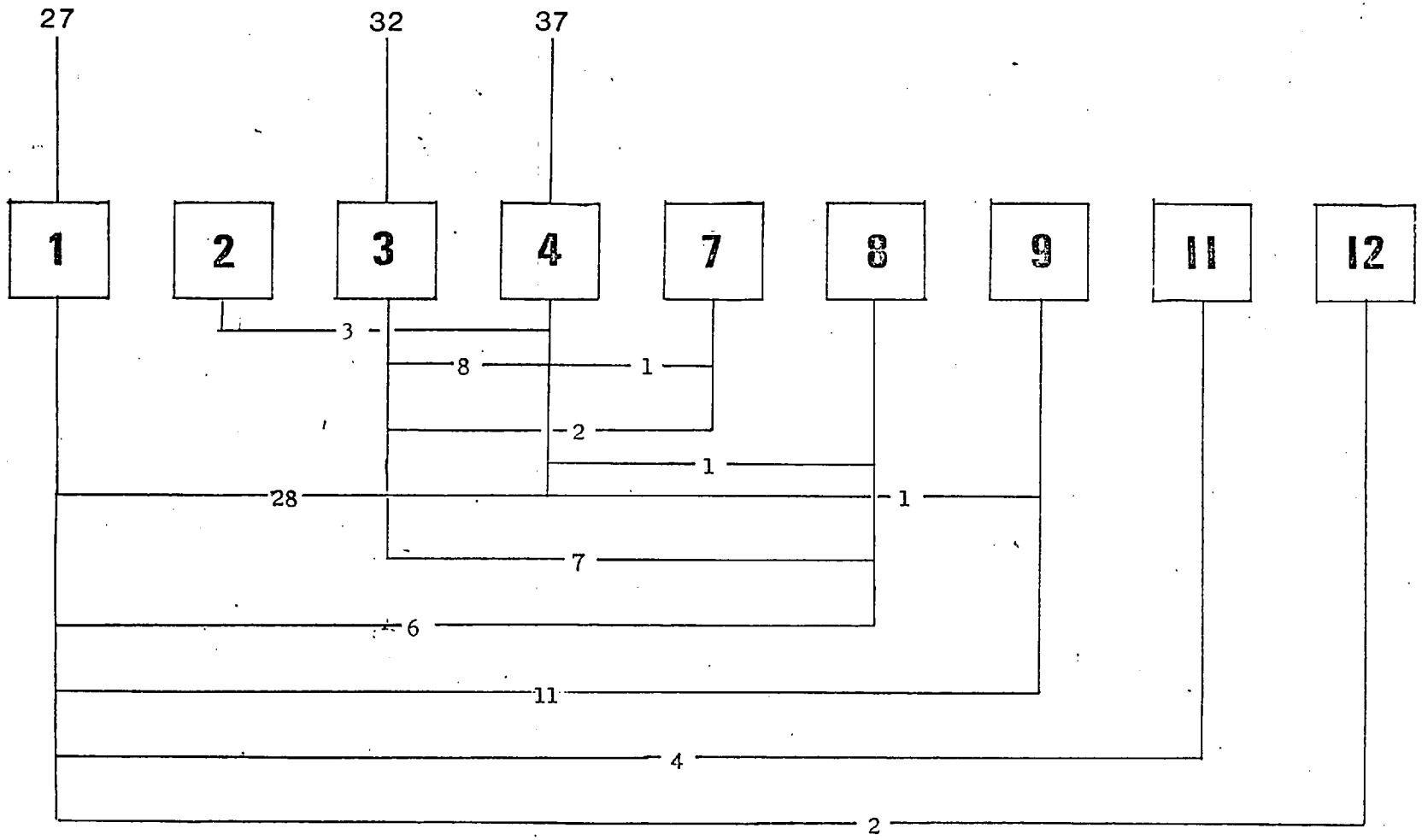
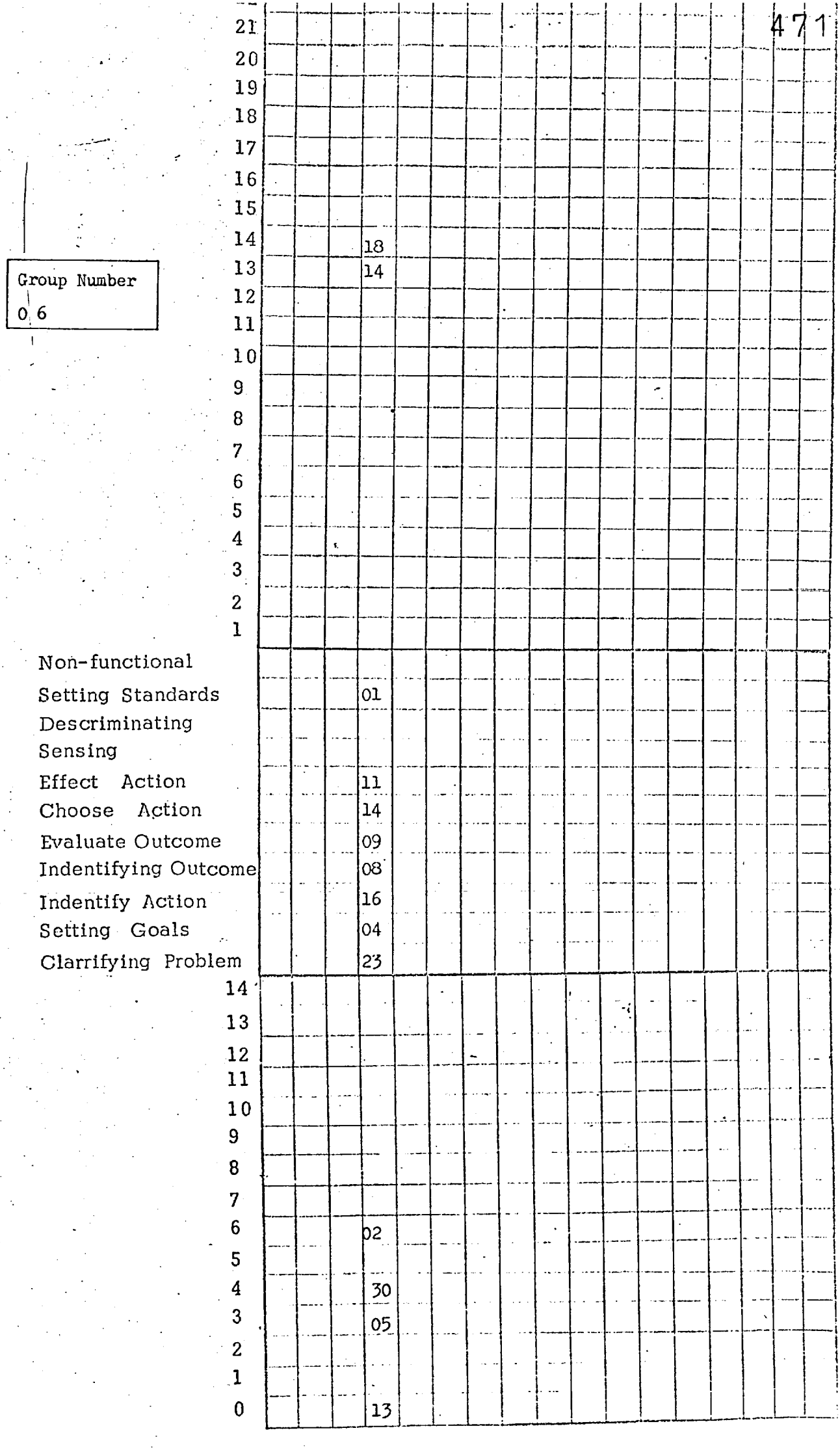
16				
15				
14				
13				
12	03			06
11			22	02
10	02		07	06
9	01		11	02
8				06
7	09			09
6				01
5			06	01
4			13	01
3				06
2	91			35
1			44	
Non-functional	08		10	04
Setting Standards	02			02
Descriminating Sensing	03		13	
Effect Action	59		52	06
Choose Action	03		21	11
Evaluate Outcome	04		08	06
Indentifying Outcome	02		07	07
Indentify Action	03		17	16
Setting Goals			04	
Clarrifying Problem	35		21	25
14				
13				
12	02			
11	04			
10				
9	11			01
8	06		07	01
7			02	01
6				
5				
4	28		08	79
3			111	06
2				03
1	117			27
0	27		32	37



group 05


Group Number
0 6
21
20
19
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18
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08
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04
23
14
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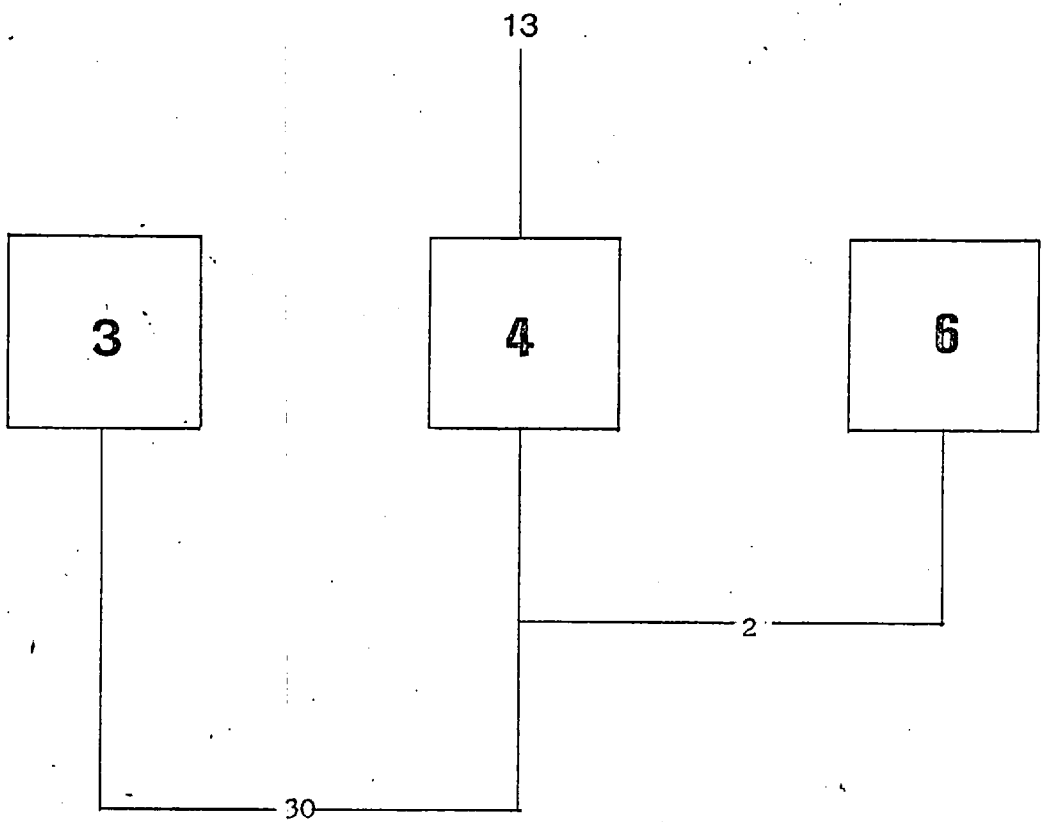
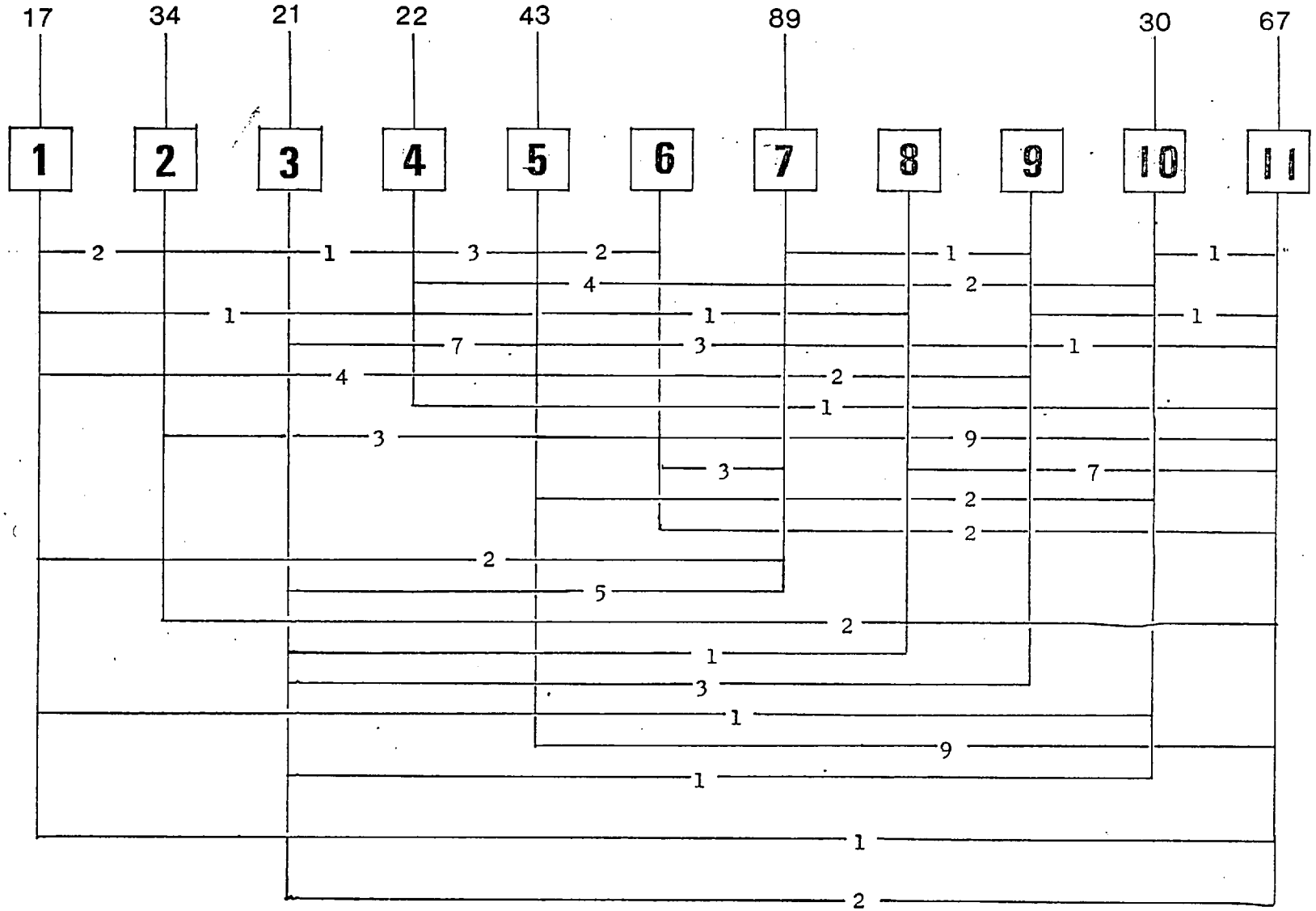
02
30
05
13
Non-functional
Setting Standards
Descriminating
Sensing
Effect Action
Choose Action
Evaluate Outcome
Indentifying Outcome
Indentify Action
Setting Goals
Clarrifying Problem



group 06

Group Number
0 8

	09	02	09		07		23			09	19
21		03	13		06		03				06
20	05		01		06						24
19	03	09	09	07	07					03	84
18											10
17					08					01	03
16				01	03						02
15				01	09						09
14	02		01		12						
13	07				05		04				05
12	23		01		09		05				04
11	01	04	01		14						03
10	06	33		03	07		02			07	02
9	01			01	01		72				
8					07						
7		02			10					51	02
6		05		01	07						05
5			22		02		02				02
4			02		02		01				07
3			03	05	07						01
2				03	12		05				06
1	01		03	08	07		73				
Non-functional	09	03	24		02		23			05	20
Setting Standards	02			01	17		09			01	02
Descriminating	01		02	01	01		10			01	04
Sensing	06		09	01			04			09	24
Effect Action	27	32	11	04	23		71			33	43
Choose Action	09	07	13	09	17		29			18	24
Evaluate Outcome			06		06		26			05	12
Indentifying Outcome			08		05		26			05	04
Indentify Action	01	07	07	05	31		37			18	42
Setting Goals				05	06		15				05
Clarrifying Problem	20	11	10	06	40		67			30	47
14											
13											
12											
11		02	02		09		01			01	150
10					02		02			74	01
9			03		02		01				01
8			01	01	04						07
7	02	01	05	04	03		114				01
6		02			02		03				02
5		03	03		86		02			05	07
4				30	03		02				01
3			63		07		04			01	01
2	02	58		01	03					01	01
1	62	02		01	04		02			01	01
0	17	34	21	22	43		89			30	67



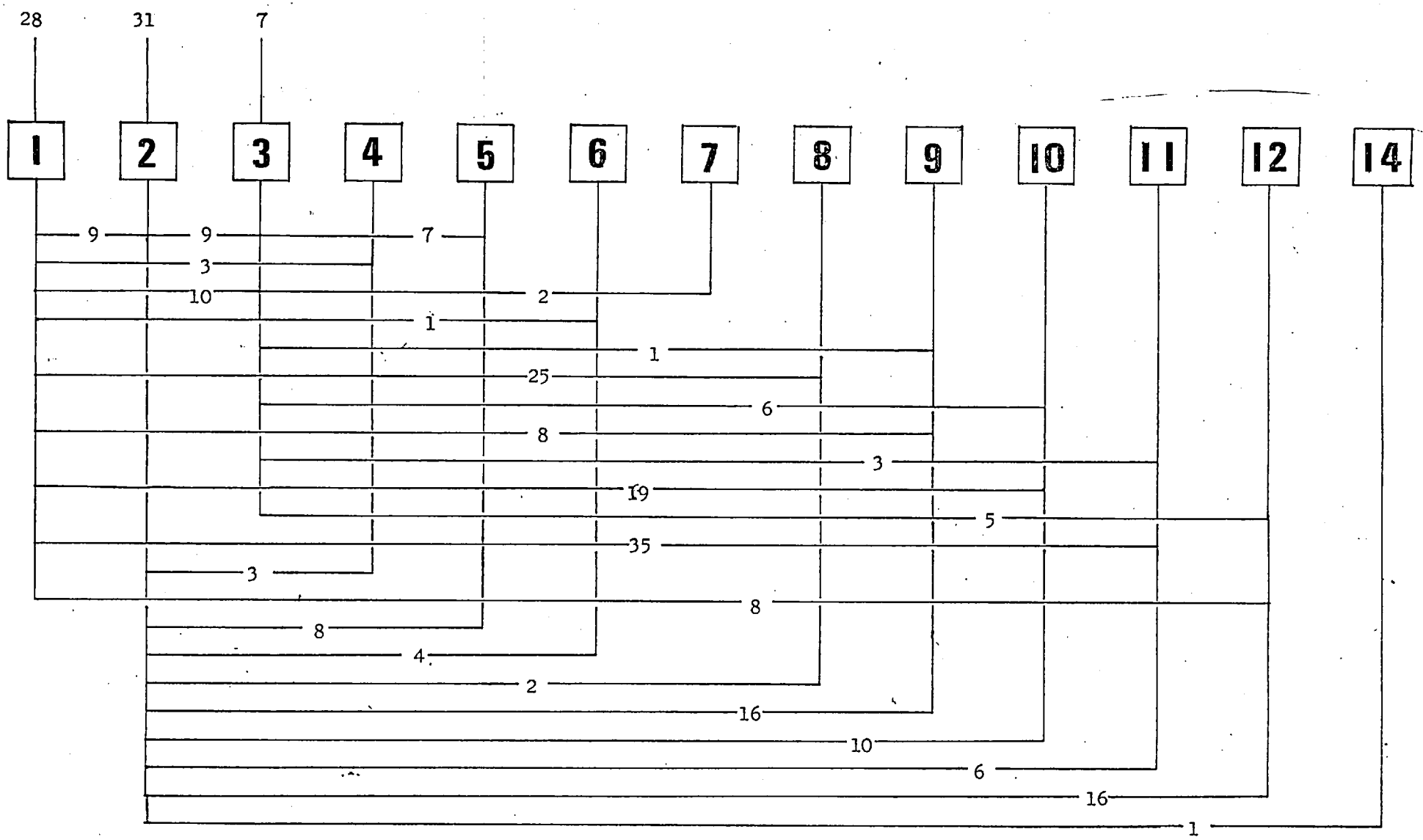
group 08

Group Number
09

22	07	10	08
21	09	16	01
20	05	07	06
19	09	01	
18	02	01	
17	76		07
16	01	01	
15	24	21	10
14	04	03	
13		01	
12	07	02	21
11	06		
10	01		
9			
8		25	
7	02	02	04
6	02		26
5		02	08
4	02		
3		11	
2	04	11	
1	42	22	37

Non-functional		08	08
Setting Standards			
Descriminating	02		02
Sensing	14	03	11
Effect Action	103	63	49
Choose Action	09	42	14
Evaluate Outcome	06	01	03
Indentifying Outcome	09	09	
Indentify Action	08	08	21
Setting Goals	03	10	06
Clarrifying Problem	41	29	14

14		01	
13			
12	03	16	05
11	35	06	03
10	19	10	06
9	08	16	01
8	25	02	
7			02
6	01	04	
5		08	07
4	03	17	
3	10	09	140
2	09	117	06
1	165	04	08
0	28	31	07


28
31
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25
6
8
3
19
5
35
3
8
8
4
2
16
10
6
16
1

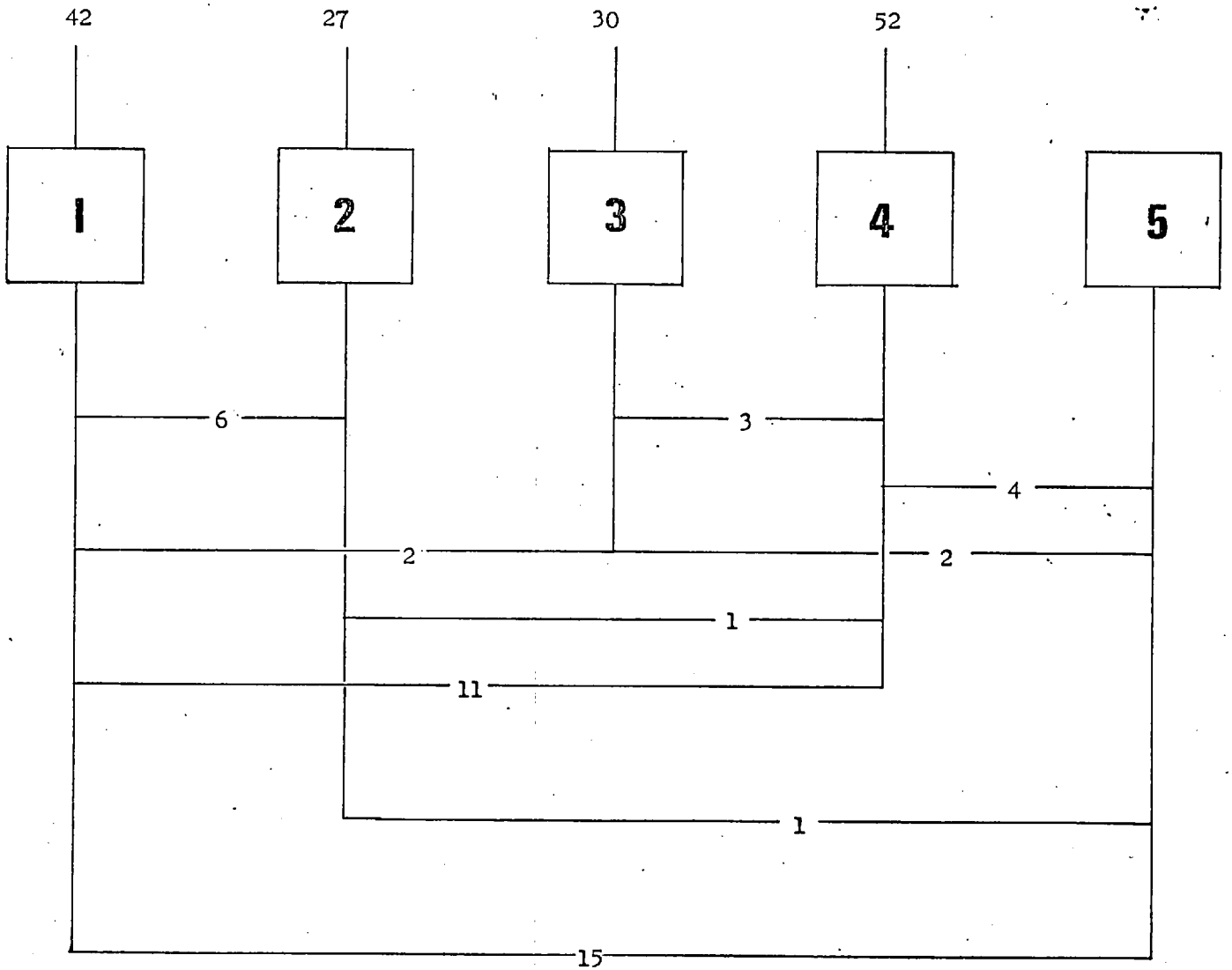
group 09

Group Number
1 2

22					
21					
20					
19	02				
18	06	03		09	
17		03	13	03	
16	21	01			
15	20		07	04	
14	02		01		
13	02		12	01	
12	13			01	
11	09				
10	14	01			
9	03		08		
8	09		04		
7	05		58		
6				07	
5	01		02		
4	06				
3	21	05		09	
2	10			119	
1	45	54		06	

Non-functional	10	11	15	03
Setting Standards	15	02	09	04
Descriminating	05		02	
Sensing	03	02	01	04
Effect Action	45	23	47	51
Choose Action	29	04	28	30
Evaluate Outcome	13		32	13
Indentifying Outcome	19	09	32	13
Indentify Action	42	11	33	27
Setting Goals	06	01	08	02
Clarrifying Problem	84	26	41	102

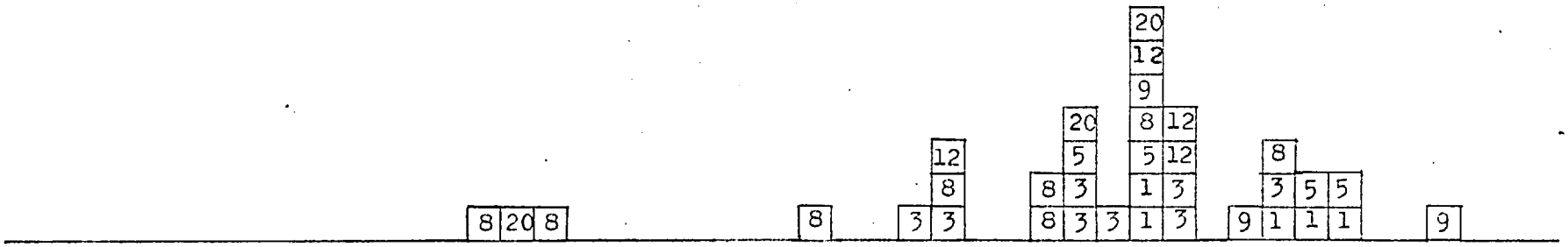
14					
13					
12					
11					
10					
9					
8					
7					
6					
5	15	01	02	04	
4	11		01	155	
3	02		92	03	
2	05	71		01	
1	132	06		12	
0	42	27	30	52	



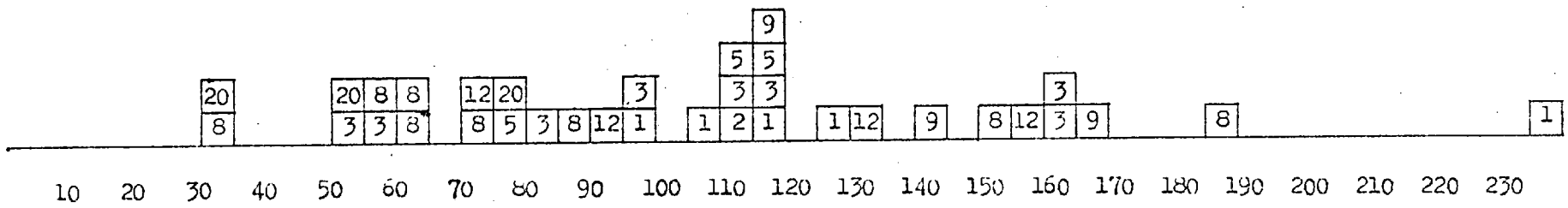
group 12

Each box on the histogram represents one individual

Figures within boxes represent the Group reference number



Number of hours covered by diary records



Number of episodes recorded

APPENDIX 13.4

Summary of Results obtained from the Management Groups

Group Number	No. of Members keeping Diaries	No. of completed Questionnaires	No. of Identified Group Tasks
01	05	04	22
02	02	01	20
03	08	06	20
04	03	02	22
05	03	01	12
06	01	01	14
08	08	07	22
09	03	03	22
12	04	04	19

APPENDIX 13.5

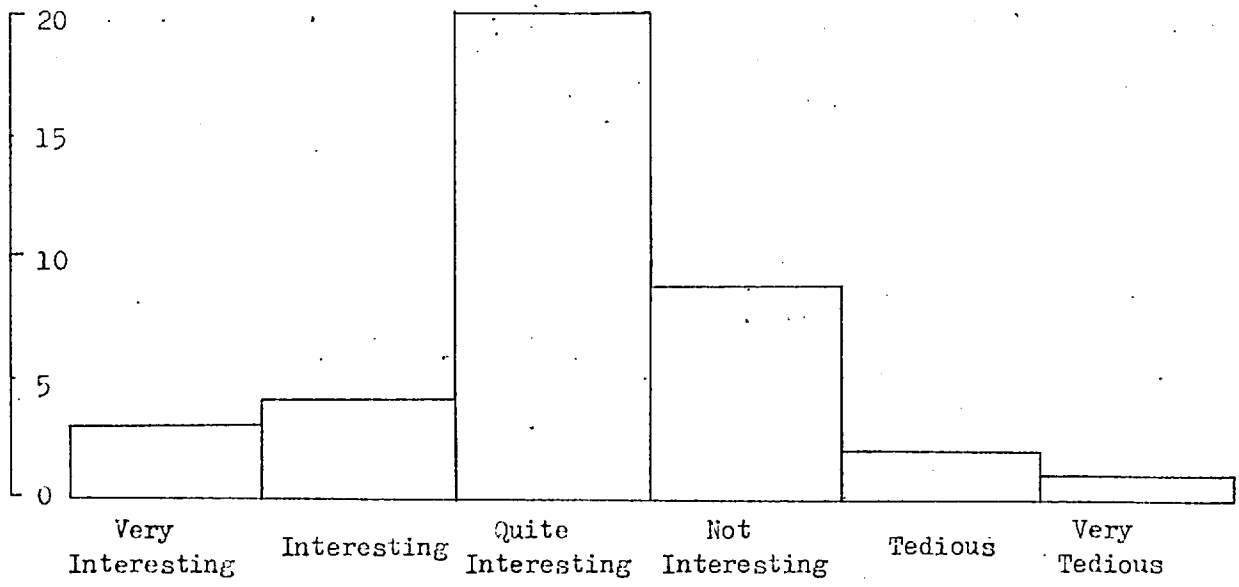
List of Individuals observed in Diary / Direct Observation Reliability Study

Group Number	Individual Number (as used in the diary code)
01	11
03	04
03	08
04	01
04	02
04	03
05	01
08	07
08	11
09	01
09	02
09	03
12	04

APPENDIX 13.6

Responses to Question Three : Management Group Project - Structure Questionnaire

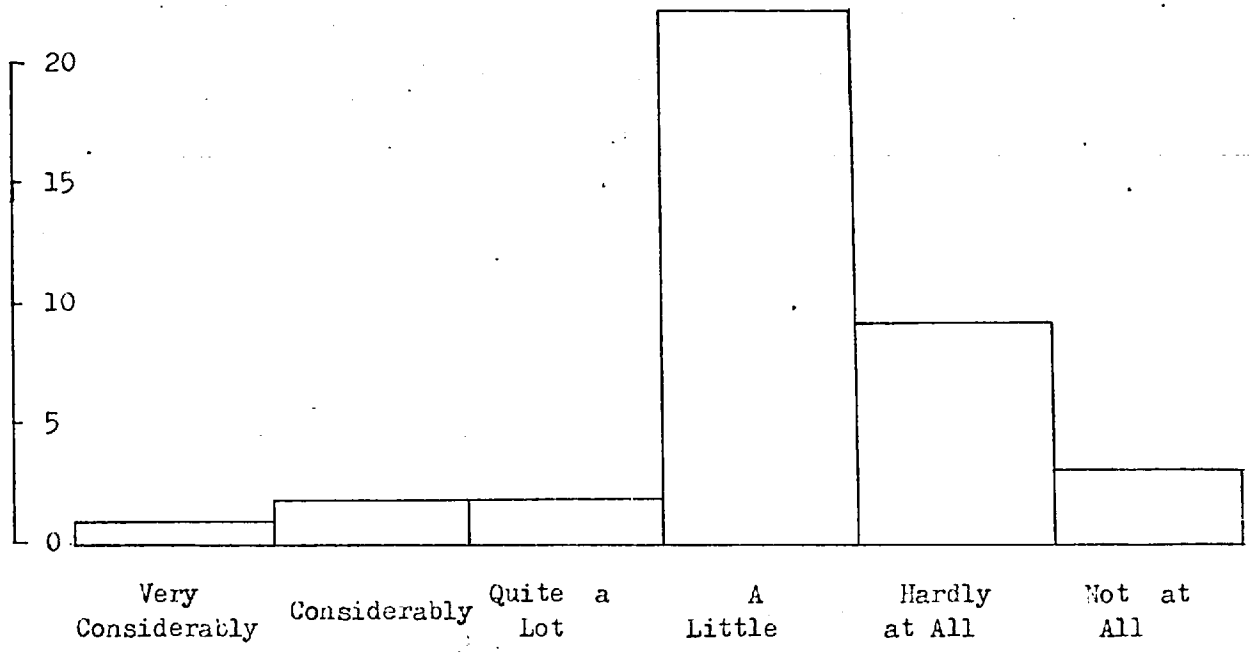
" Have you found completing the diary . . . . ? "



APPENDIX 13.7

Responses to Question Four : Management Group Project - Structure Questionnaire

" Has completing the questionnaire (diary) added to your normal workload ? "



APPENDIX

13.11

Diary Record and Observation Record compared

Member	1		4		11		4		8		
22	10	19			18	16					
21	05	04									
20	01	04					12	14			
19	05	04									
18	01	01	03	06							
17	48	28	03								
16	01										
15	16	03	04								
14		04									
13			01								
12	01	06		01	19	17					03	
11		05			19	21						
10	01				06	05					02	
9					57	63	01	02				01
8					07	07						
7	02				01						08	01
6	01	01	04	03			23	18				
5							15	07				
4	01	01							19	06		
3			03	06			06		32	29		
2	01	03	63	56			18	08	13		52	39
1	24	18	01	05			17	26	13	31		
SS			01	02	06	06	16	21	23	22	03	05
SS			04	01			01	01	01		02	
D		02					02	05	12	15		
S	07	07	04				07	12	08	12	01	02
EA	59	44	35	16	68	70	17	18	18	24	31	28
CA	09		20	10	22	27	11	13	07	04	02	01
EO	04	02	08	05	02	08			02		01	03
IO	08	01	07	06	09	15					01	01
IA	07	01	17	10	27	34	06		14	12	02	01
SG	01	02		02		01						
CP	19	22	55	47	42	41	19	17	20	15	21	14
14												
13												
12		03									02	02
11	22	13			134	142					02	01
10	09	10			01							
9	06	02					01	03	05		07	04
8	16	09						01	85	76	04	02
7					01		09	06	01			
6	01					01	09	06				
5							01	02	01			
4	01	02	86	69			85	75	01		10	16
3	05	05	02	01		01			01			
2	06	03	01	01		03	03	02				
1	93	72	06	06		01	19	14	04	02	68	49
0	12	15	27	25	95	88			07	05	16	11

Member	7			11			2			3			2			3			1	
22	09	14		10	09		04	09		03	06					01	01			
21	01	02		05	01		04	12			01									
20				14	10			07		06	01					01				01
19				55	28			01								02	01			
18				03	07			01						01					03	
17				01	02					03	03					02	04			
16				01	01			01		02	01		04	02		01	04			
15				05	04		14	07		04	06			01		03	01		01	
14							02	01								03	05			02
13	02	02		03	02		1						01			01	01			
12	05			03	01			02		06	16									
11				03									01			03	02			
10	02			01	01											01	01			01
9	38	34																		
8							17	08		04			01			03	02			
7				01	01		02									01	01			
6				05						13	12					04	04			
5	03				02		02			03	05					02	02		02	02
4	01			02	05											01	02			
3				01			02	02						02		02	02		01	08
2	02	03		04	02		09	02					08	09		01	04		10	11
1	42	31					20	02		17	16		02	02		02	03		02	01
NF	09	14		11	09		03	03		07	04		02	04					06	02
SS	03	06		02												01	04			
D	04	06		01	03					02	01					01	04			01
S	01	03		04	20		02	01			04		05			03	04			
EA	40	31		25	18		34	29		22	32		01			02	02		09	11
CA	14	15		17	07		10	32		07	05		06	08		05	07		01	04
EO	14	12		04	08											02	01		01	01
IO	11	15		02	02		02	07								01			01	01
IA	18	19		26	16		01	21		09	13			01		04	05		02	
SG	06	09		04	01			10		03	05					07	04			03
CP	43	24		31	16		18	11		09	05		01	01		09	07		04	06
14		01			01			01												
13																				
12							05	11		01	05									
11	01			85	65		06				03									
10	02			01			05	05		03	03									
9		01			01		03	13			01									
8				03	04		02	02												
7	102	92			01					02										
6		02		02			03	01												
5	02			04	03		07	01		05	02									
4	02	02			01		10	07												
3					01		03	06		64	65			02		36	43		02	05
2				10			74	52		03	02		20	14		01			01	02
1	01	01		01				04		06	02						03		24	27
0	54	35		41	26		20	11			05		09	05		08	26		07	06

Split Half Reliability Coeffecients for Individual Diary Records

Group	Person	People Frequencies	DM Behaviour Frequencies	Task Activity Frequencies
9	1	0.990	0.955	0.894
12	4	0.998	0.946	0.989
1	11	0.996	0.991	0.997
3	4	0.998	0.886	0.696
3	8	0.999	0.871	0.570
5	1	0.968	0.976	0.992
8	7	0.990	0.931	0.971
8	11	0.998	0.667	0.949

Data used in the split - half reliability/consistency of managerial activity test of diary records.

N F		02					01	02		05	05		09	08		01	01	03	04		04	05		02	05		01	03		01	06			01		02	03
S S				02	01													01	02														01	02			
D		01								01			03	02				02	02												01		01	01			
S	02	03		01	01					04	04		05	06		01	01	01	02		01	02		01	01		01	03		02	04		01	01			01
E A	17	16		15	16		20	18		07	08		07	07		12	13	10	11		08	07		09	06		09	12			03		01	02		03	04
C A	02	01		09	08		10	11		05	05		02	01				04	03		07	08		04	04		02	03		02	05		03	04			01
E O		02		02	01		01	03								02	02	04	02		01	01												01			01
I O	02	02		02	03		03	02										04	04		02	02		01	03						03					01	02
I A	02	03		08	08		15	17		02	02		04	03				07	06		08	07		01	08		04	05			02		01	01		01	02
S G					01			01										03	02		01	02					03	06			03		01	02			
C P	06	08		20	18		17	15		06	07		06	05		05	07	10	12		14	15		07	05		03	03		01	06		03	04		02	03
14																		01	01																		
13																																					
12																01	01							02	02		01	01									
11	07	07					49	50													34	34		02	02		01	01									
10	03	04																			01			01	01		01	01									
9	02	02														01	01							02	02												
8	04	04											25	26		01	01																				
7							01	01		04	04							32	33																		
6										03	03							01	01		01	01		01	01												
5																								02	02		02	02									
4	01	01		30	29					27	28					07	06							04	03												
3	02	02																						01	01		19	25			02		20	23		01	01
2	01	01		01	01					01	01										06	06		27	29		01	01		08	19						01
1	33	35		02	02					06	06		01	01		19	19	01	01								02	02			01		01	01		08	12
0	04	03		11	13		38	38					02	02		03	02	14	15		17	18		05	05			04		03	05		10	10		02	02

Left-hand column for each person gives the diary result for the first half of the self-recording

Split - Half Indices derived from Diary Records

Number of tasks identified per episode

1.27	1.47
.95	1.12
.95	.91
1.08	1
.96	.81
1.03	.93
1.054	1.115
.953	1.03
.944	.86
.91	.87

CHI-SQUARE EQUALS 5.98169E-02 ON 9 DEGREES OF FREEDOM

Number of decision-making / control categories identified per episode

1.16	1.12
1.313	1.423
.94	1.06
1.235	1.421
.941	1.163
1.461	1.685
1.365	1.538
.907	1.06
.972	.877
1	1.074

CHI-SQUARE EQUALS 4.09894E-02 ON 9 DEGREES OF FREEDOM

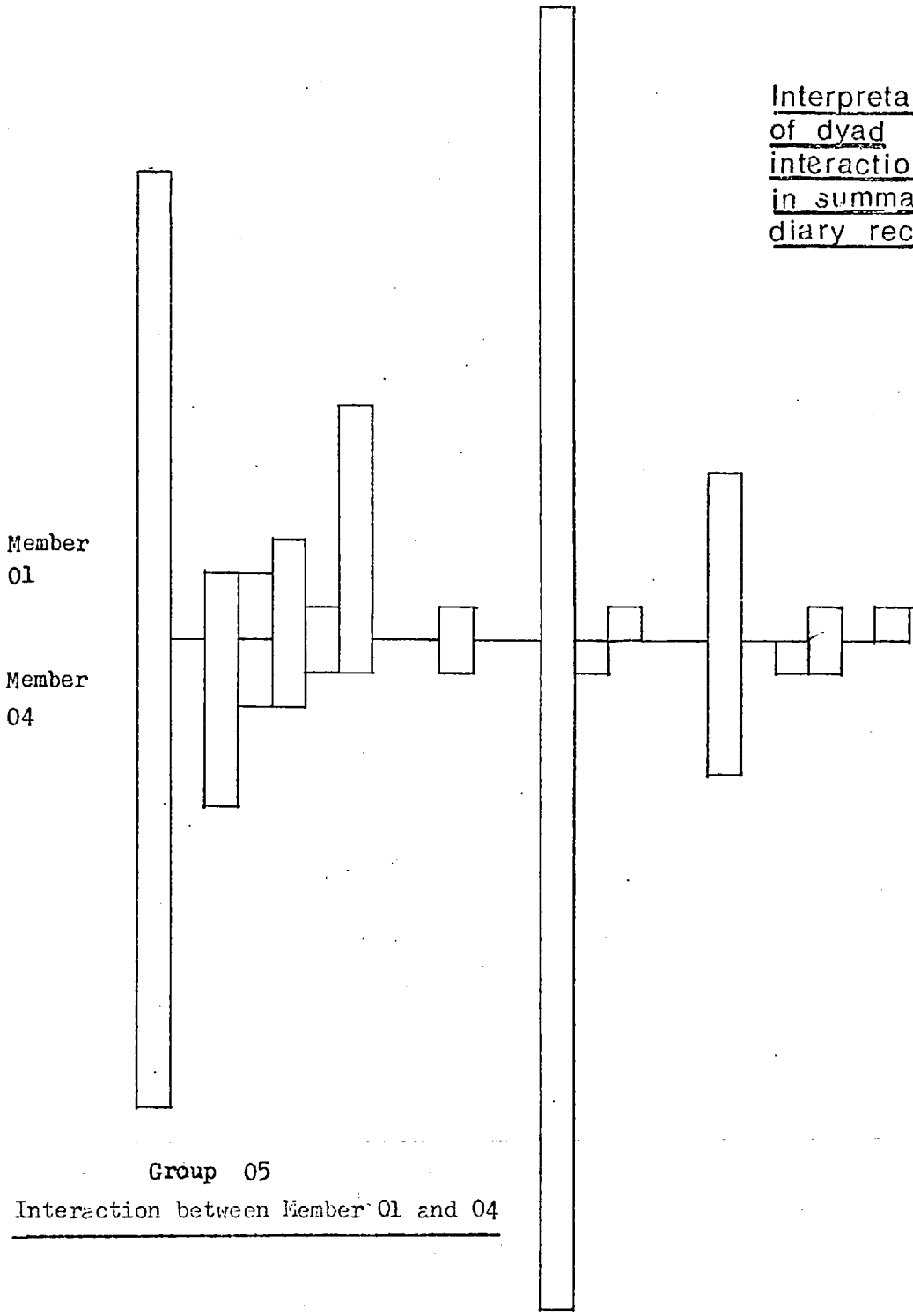
Number of other people involved in episodes

.849	.861
.419	.464
.724	.655
.494	.453
.235	.105
.618	.776
.608	.451
.682	.57
.3125	.354
.45	.5

CHI-SQUARE EQUALS .109894 ON 9 DEGREES OF FREEDOM

"Profile" display of the summary diary records for two managers over the first and second half of diary keeping period *APPENDIX 13.15*

Interpretation of dyad interaction in summated diary records



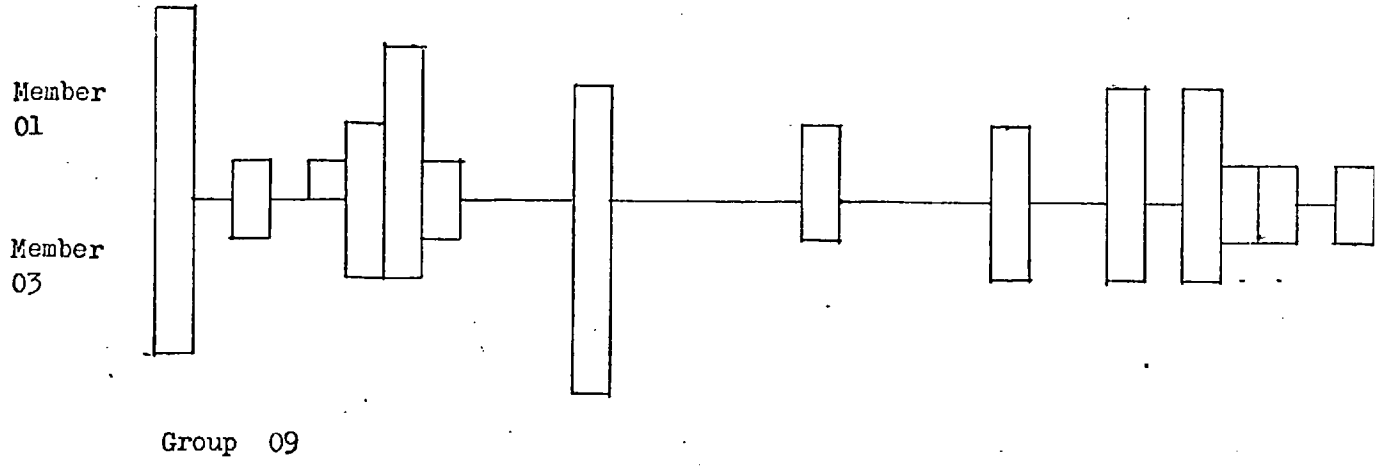
Group 05

Interaction between Member 01 and 04

Control and Decision - m

Group Task Number Lists

CP SG EA IO ED CA EA S D SS NF 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16



Group 09

Interaction beteen Members 01 and 03

Number of Task

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
02								X	X	X	X	X	X	X	X	X	X	X	X	X	X	
05	X	X	X	X	X	X	X															
07	X	X	X	X	X	X	X															
08	X	X	X	X	X	X	X													X		
11	X							X	X	X	X	X										

Group 01

02	X	X	X	X	X	X			X		X	X										
03	X	X			X		X	X				X		X	X	X		X				

Group 02

01	X	X	X	X	X	X	X	X	X	X	X		X	X						X		
03	X	X	X	X	X	X	X	X	X		X		X						X	X		
04	X	X	X	X	X	X	X	X	X				X	X	X					X		
05	X	X	X		X	X	X		X			X								X		
06	X	X	X		X	X	X		X	X										X		
07	X	X	X	X	X	X			X						X					X		
08	X	X	X	X	X	X			X	X							X			X		
09	X	X	X	X	X	X					X	X	X			X				X		

Group 03

01	X	X	X	X	X	X	X	X	X	X				X	X	X	X	X	X	X		X
02	X	X	X		X										X	X						
03	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Group 04

01		X	X	X		X	X		X	X	X	X
03	X				X	X			X	X	X	
04		X	X	X	X	X	X	X	X	X	X	X

Group 05

Patterns of tasks associated with individuals in groups identified in episodes included in diary records

Number of Task

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
01										X	X	X	X	X	X				X	X	X	X
02						X	X			X	X	X						X	X	X	X	X
03	X	X	X	X	X					X	X	X							X	X	X	X
04	X	X	X	X	X	X			X	X					X	X	X		X			X
05	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X
07	X	X	X	X	X				X	X	X	X	X							X	X	X
10							X			X	X							X	X	X		
11		X	X	X	X	X	X		X	X	X	X	X		X	X	X	X	X	X	X	X

Group 08

01	X	X		X	X	X	X			X	X	X	X	X	X	X	X	X	X	X	X	X
02	X	X	X	X	X	X	X	X		X		X	X	X	X	X		X	X	X	X	X
03	X	X	X		X	X	X		X			X	X	X	X	X		X	X	X	X	X

Group 09

01	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X		X	X			
02	X	X	X	X					X	X	X	X	X			X	X	X				
03					X	X	X	X	X				X	X	X	X	X	X				
04	X	X	X	X	X	X					X	X	X	X	X	X	X	X	X			

Group 12

Patterns of tasks associated with individuals in groups identified in episodes included in diary records

APPENDIX 13.18

	Task No.	Supplies Information to another part of the organisation	Supplies Information or Makes Decisions	Makes Decisions concerning particular activity
Group 01	1		1	4
	2		1	4
	3		1	4
	4		1	4
	5		1	4
	6		5	
	7		5	
	8		4	1
	9		3	2
	10		3	2
	11		3	2
	12	1	4	
	13	1	3	1
	14		5	
	15		5	
	16		4	1
	17			5
	18		5	
	19		3	2
	20			5
	21		4	1
	22			
Group 03	1		4	2
	2		6	
	3		1	5
	4		3	3
	5	1	4	1
	6	2	4	
	7	1	5	
	8	4	2	
	9	1	5	
	10		6	
	11	4	2	
	12	3	3	
	13	2	4	
	14			6
	15		6	
	16	2	4	
	17	3	3	
	18	1	3	2
	19	2	3	1
	20			

Function of Groups in respect of required tasks in the Management group :

Response to Question 6 in the Questionnaire

	Task No.	Supplies Information to another part of the organisation	Supplies Information of Makes Decisions	Makes Decisions concerning particular activity
Group 08	1		7	
	2		5	2
	3		4	3
	4	1	3	3
	5		5	2
	6	2	4	1
	7		6	1
	8	3	3	1
	9		4	3
	10		6	1
	11		6	1
	12		4	3
	13	1	3	3
	14	4	2	1
	15		4	3
	16	1	5	1
	17	2	4	1
	18		7	
	19		7	
	20		3	4
	21		4	3
	22			
Group 09	1		1	2
	2		3	
	3		1	2
	4		3	
	5		1	2
	6		1	2
	7	1	2	
	8			3
	9		2	1
	10		3	
	11		3	
	12			3
	13		1	2
	14		1	2
	15		3	
	16		2	1
	17		1	2
	18		3	
	19		3	
	20		3	
	21		1	2
	22		2	1

	Task No.	Supplies Information to another part of the organisation	Supplies Information or Makes Decisions	Makes Decisions concerning particular activity
Group 12	1		4	
	2		1	3
	3		2	2
	4			4
	5			4
	6		3	1
	7			4
	8			4
	9			4
	10			4
	11			4
	12		1	3
	13		2	2
	14		1	3
	15		3	1
	16	1	2	1
	17		4	
	18	2	2	
	19			

APPENDIX 13.13

	Task No.	Decisions made by group members identified in Qu.5 alone	Decisions made by a combination of people inside and outside your group	Decisions made by people who are not members of your working group
Group 01	1	5 7 8		
	2	5 7 8		
	3	5 7 8		
	4	8		
	5	7 8		
	6	8		
	7	8		
	8	2 3 6 11		
	9	3 6		
	10	1 6		
	11	6		
	12	1 6 10		
	13	2		
	14	2		
	15	1 6		
	16	2		
	17	2 1 6 8		
	18	2 3 6		
	19	6		
	20	3 6 8		
	21	2 6		
	22			
Group 03	1	1 2 3 4 5 6 7 8 9		
	2	1 2 3 4 5 6 7 8 9		
	3	1 2 3 4 5 6 7 8 9		
	4	1 2 3 4 5 6 7 8 9		
	5	1 2 3 4 5 6 7 8 9		
	6	1 2 3 4 5 6 7 8 9		
	7	1 2 3 4 5 6 7 8 9		
	8			yes
	9	1 2 3 4 5 6 7 8 9		
	10	1 6 8 9		
	11			yes
	12	9		
	13	1 2 3 9		
	14	1		
	15	1 4 9		
	16	1 7 9		
	17	9		
	18	1 8 9		
	19	3 9		
	20			

Identification of group members concerned with taking decisions with respect to each separate numbered Management group task : Response to question 7 in the post - diary keeping Questionnaire .

	Task No.	Decisions made by group members identified in Qu.5 alone	Decisions made by a combination of people inside and outside your group	Decisions made by people who are not members of your working group
Group 08	1	1 2 3 5 7 9 10 11		
	2	5 7 9		
	3	5 9		
	4	5 11		
	5	3 9		
	6	8		
	7	5 9 10		
	8	5 8		
	9	7		
	10	1 2 4 9 10		
	11	5		
	12	1 5		
	13	9		
	14			yes
	15	5 9 11		
	16	5 9		
	17	8		
	18	5 11		
	19	1 2 3 4 5 6 8 9 10 11		
	20	5 9 11		
	21	3 5 8 9		
	22			
Group 09	1	1 2 3		
	2	1 2 3		
	3	2		
	4	1 2 3		
	5	2 3		
	6	1 3		
	7	3		
	8	2 3		
	9	1 2 3		
	10	1 3		
	11	1		
	12	1 3		
	13	2 3		
	14	1 2 3		
	15	1 2 3		
	16	1 2 3		
	17	1 3		
	18	1 2 3		
	19	1 2 3		
	20	1 2 3		
	21	1 2		
	22	1 2 3		

	Task No.	Decisions made by group members identified in Qu.5 alone	Decisions made by a combination of people inside and outside your group	Decisions made by people who are not members of your working group
Group 12	1	1 2 5		
	2	1 4 5		
	3	1 2 3 4 5		
	4	1 5		
	5	1 3 5		
	6	1 4		
	7	3		
	8	1 2 3 4 5		
	9	5		
	10	1 5		
	11	1 5		
	12	1 5		
	13	1 3 4 5		
	14	5		
	15	1		
	16	1		
	17	2 3 4		
	18	1 5		
	19			

In this appendix the list of group members concerned with decision - making with respect to each group task has been entered without reference to whether or not they have been identified by the management unit as being concerned with the task . The absence of an entry in the last task of many groups indicates that this task number was used as a non - specific " other task(s) " category .

Task Structure of Management Groups : No. of Tasks carried out by each group mem. expressed as a percentage of the total number of tasks listed for that group .

Group Size	Group No.	Percentage of Group tasks with which each member was concerned									
		10	20	30	40	50	60	70	80	90	100
3	04			1						1	1
	09								1	2	
4	05					1			1	1	1
	02				1	2	1				
5	11							2		2	1
9	03			1		4	1	3			
11	01		2	3	3	1		1	1		
	08			2	1	2	4			1	1
Total freq. for 8 groups			2	7	5	10	6	6	3	7	4

This table of frequencies represents the no. of tasks associated with 50 group members making up 8 management units in the Organisation .

Decision Structure of Management Groups : No. of Tasks in which each group member participated in decision - making expressed as a percentage of the total number of tasks listed for that group

Group No.	Percentage of Group Tasks with which each group member was involved in decision - making									
	10	20	30	40	50	60	70	80	90	100
01	4	4		1	1	1				
03					5	1	1	1	1	
08	2	5	2			1	1			
09								1	1	1
12			1	2				2		
Total freq 5 Groups	6	9	3	3	6	3	2	4	2	1

APPENDIX 13.22

	Group 01				Group 03				Group 08			
	Decision - making structure type used for Group tasks											
	A	B	C	D	A	B	C	D	A	B	C	D
1	1						1			1		
2	1						1		1			
3	1						1			1		
4	1						1			1		
5	1						1		1			
6	1						1		1			
7	1						1		1			
8	1							1	1			
9	1						1		1			
10	1				1				1			
11				1				1	1			
12		1			1				1			
13	1				1				1			
14	1				1							1
15		1				1			1			
16	1					1				1		
17		1			1				1			
18		1				1				1		
19				1		1			1			
20		1					1		1			
21		1							1			
Total Number	13	6	0	2	5	4	9	2	15	5	0	1

Profile and Summary of Decision - making structure over the management tasks of the three Organisation Groups.

Decision - making Structure categories

Type A - Decisions taken by those responsible for carrying out the task .

Type B - Decisions taken by those concerned with the task with others (either within or outside the groups)

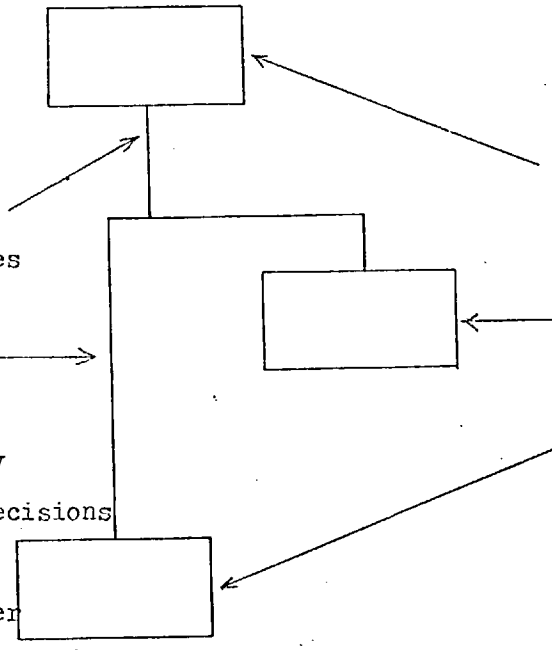
Type C - Decisions taken by the whole group.

Type D - Decisions taken by those (either within or outside the group) who are concerned with the task.

Organisation - Recognised Structures of Management Groups studied

In the following pages the structure of the management groups studied (the structure recognised by the Organisation as a whole and by the management group themselves) are charted .

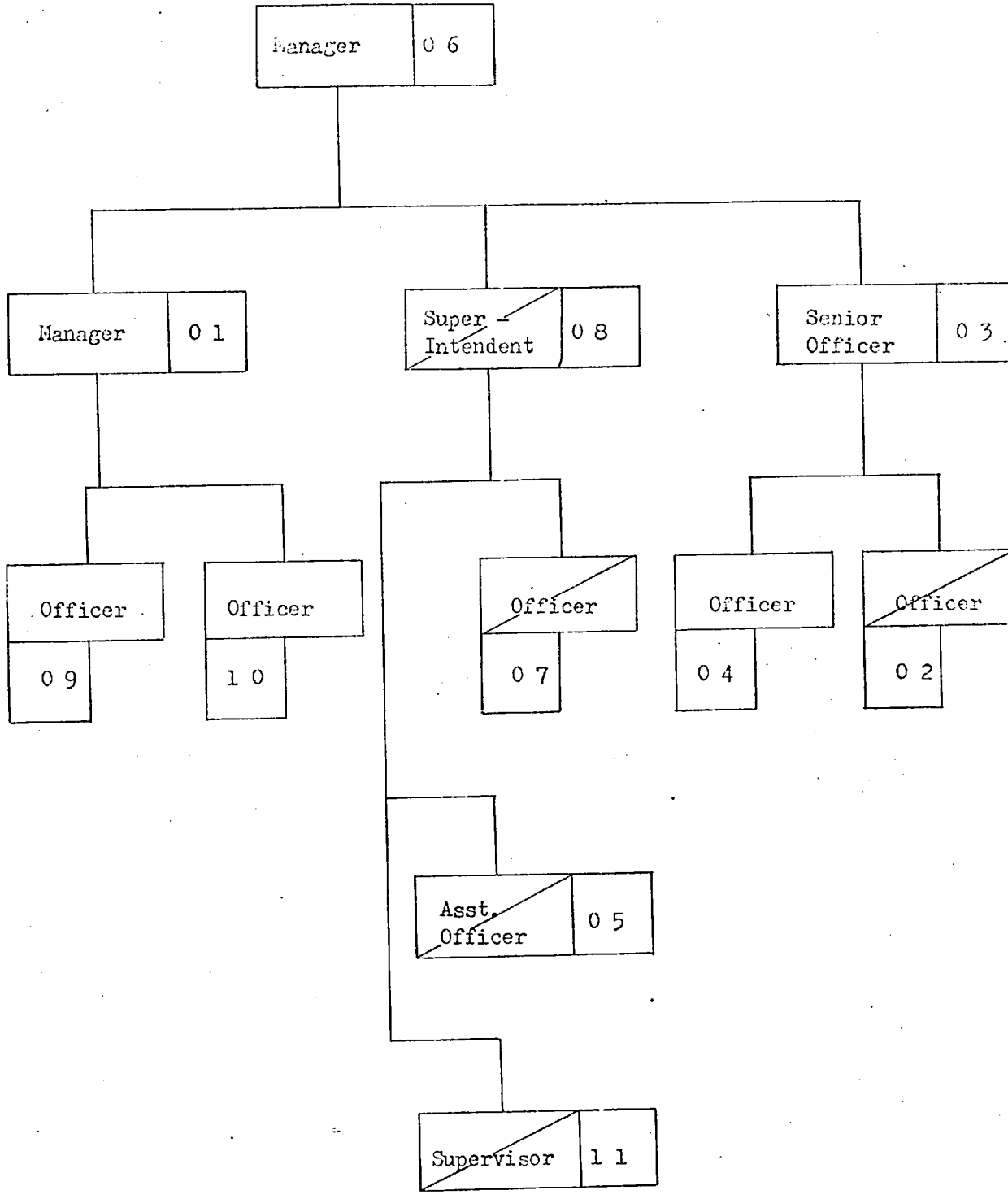
The following implications relate to all the group structures shown : -



A direct vertical line linking two positions indicates that the higher position has the organisational recognised ability to " override " decisions made by the person in the lower position .

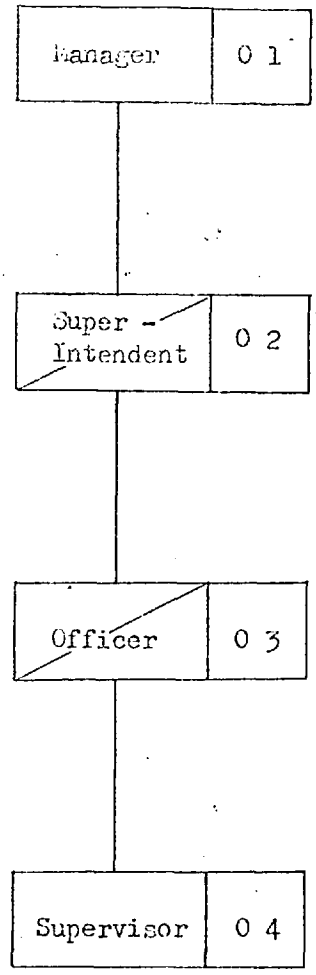
"Positions" are placed in vertical array at points corresponding to recognised differenti status . The number of levels generally corresponds to the status code used i.e. Managers , Superintenden

The titles used have been reduced to the status implication only . The designation of some positions as " senior manager " represents only that he is organisational recognised as being in a substantial senior position . He is not called a senior manager and is only recognised in the examples here by the existance of managers amongst the staff who report to him within the group .



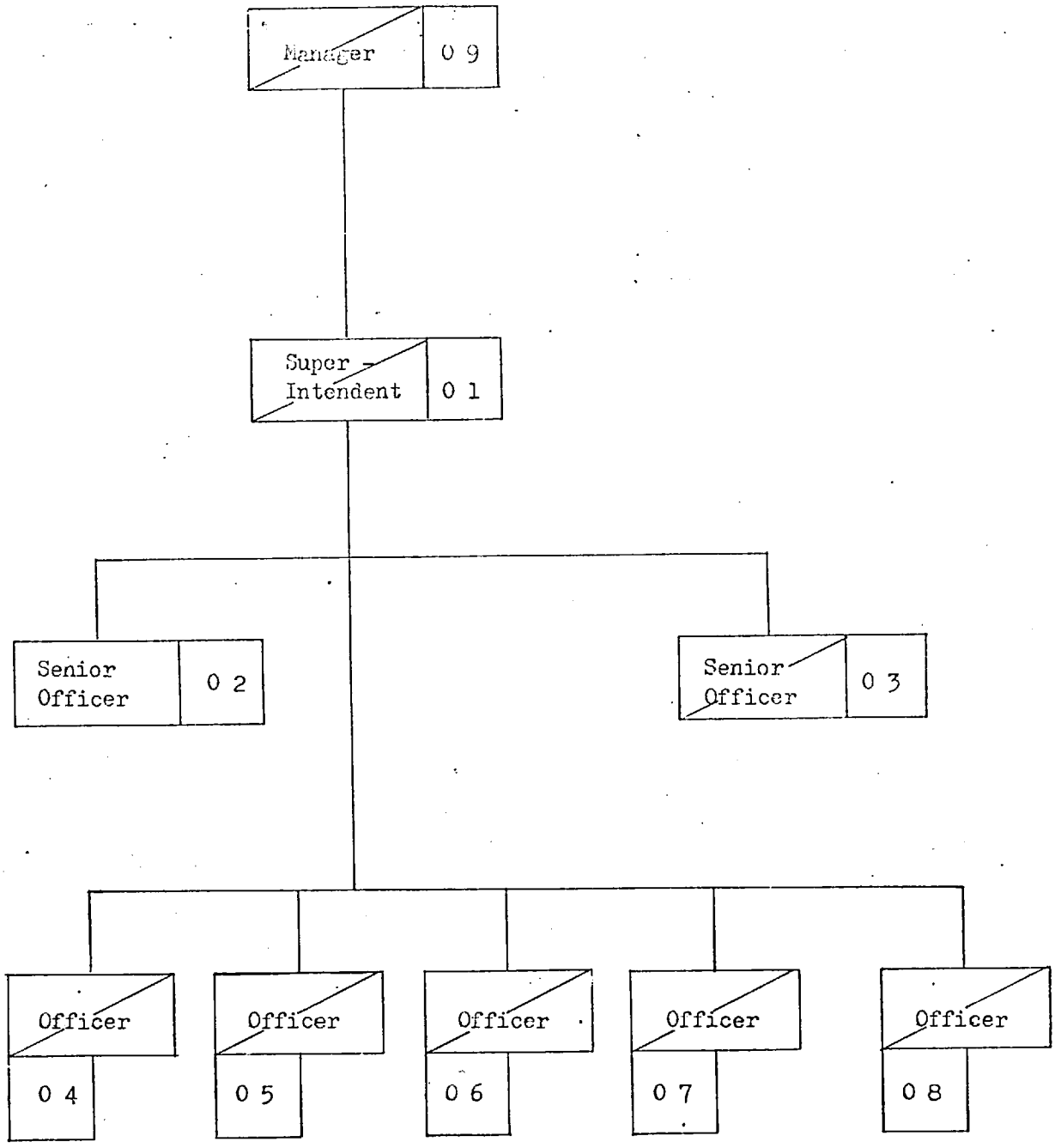
Group Structure : Group 0 1 Personnel Division

Numbers represent the diary code numbers for this group . Only those group members with a diagonal line returned completed diaries . Staff 0 1 , 0 9 and 1 0 were not able to take part in the study .



Group Structure : Group 0.2 Commercial Division

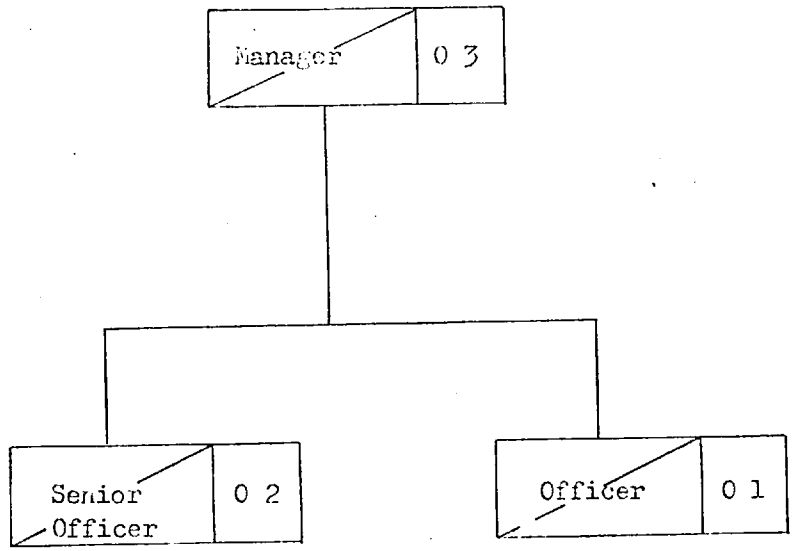
Numbers represent the diary code numbers for this particular group . Only those group members indicated by a diagonal line returned completed diaries .



Group Structure ; Group 0 3 Sales Division

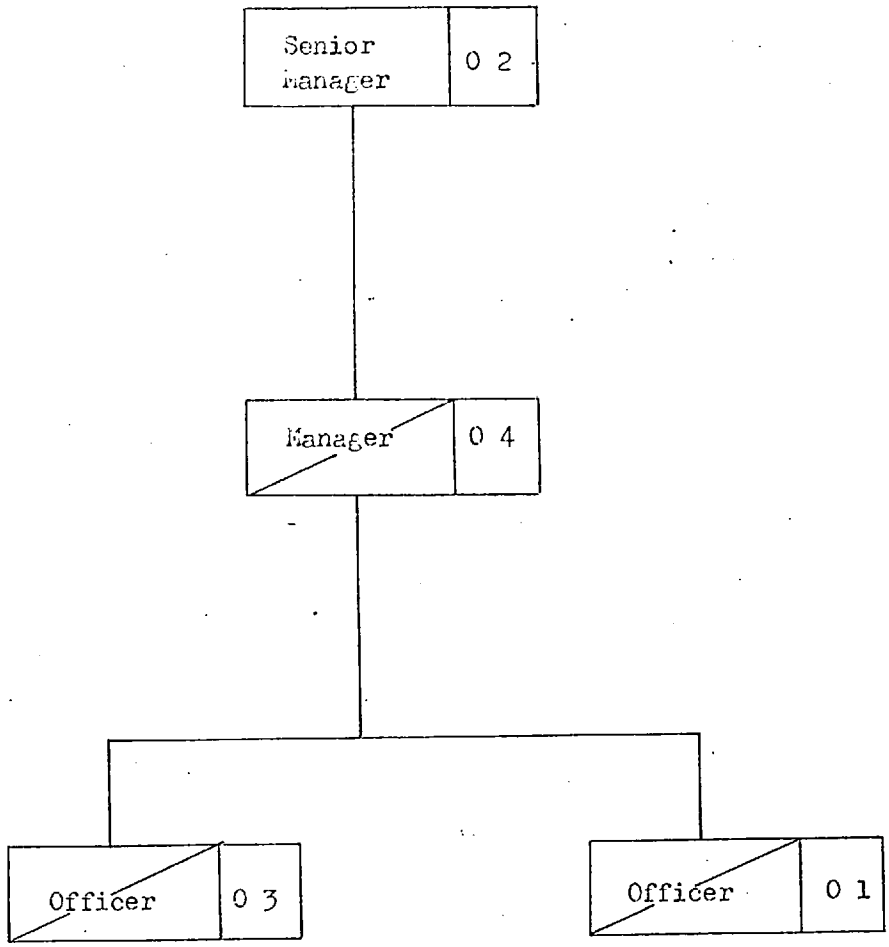
Numbers represent the diary code numbers for this particular group .

Only those group members indicated by a diagonal line returned questionnaires .



Group Structure : Group 0 4 Commercial Division

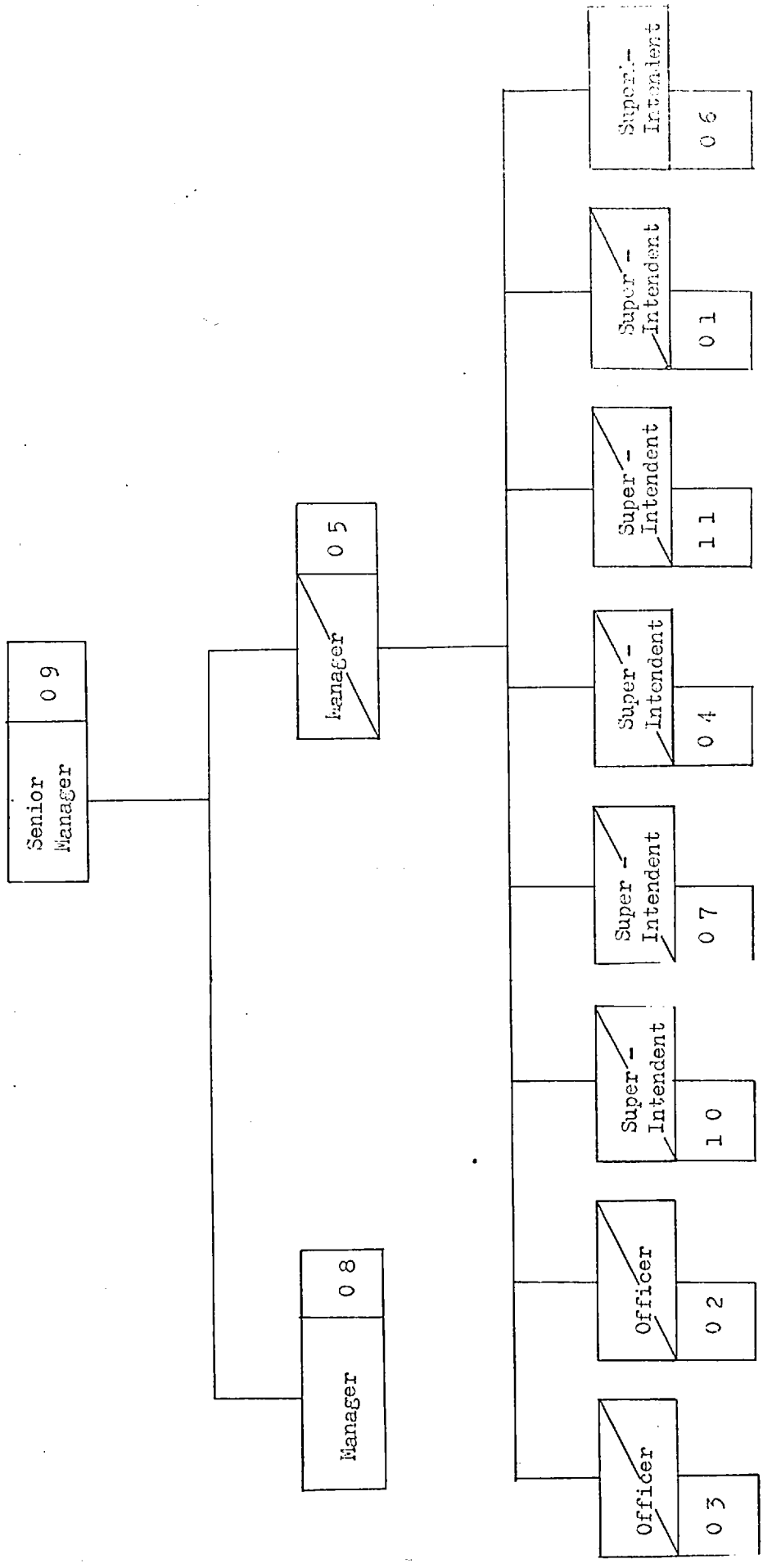
Numbers rpresent the diary code numbers for this group .



Group Structure : Group 0 5 Sales Division

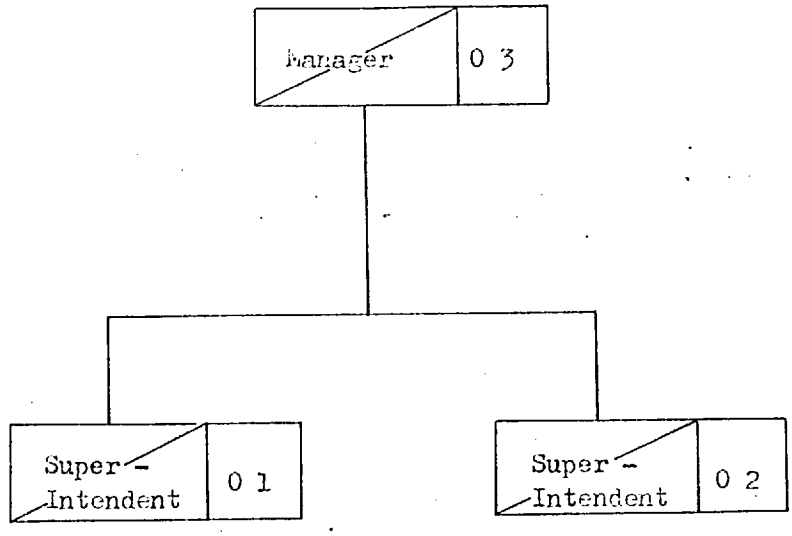
Numbers represent the diary record code for this group . Only those member with a diagonal returned completed diaries .

Numbers 0 5 to 1 2 in the person number code indicate other sections and managers identified within B E A .



Group Structure : Group 0 8 Cargo Division

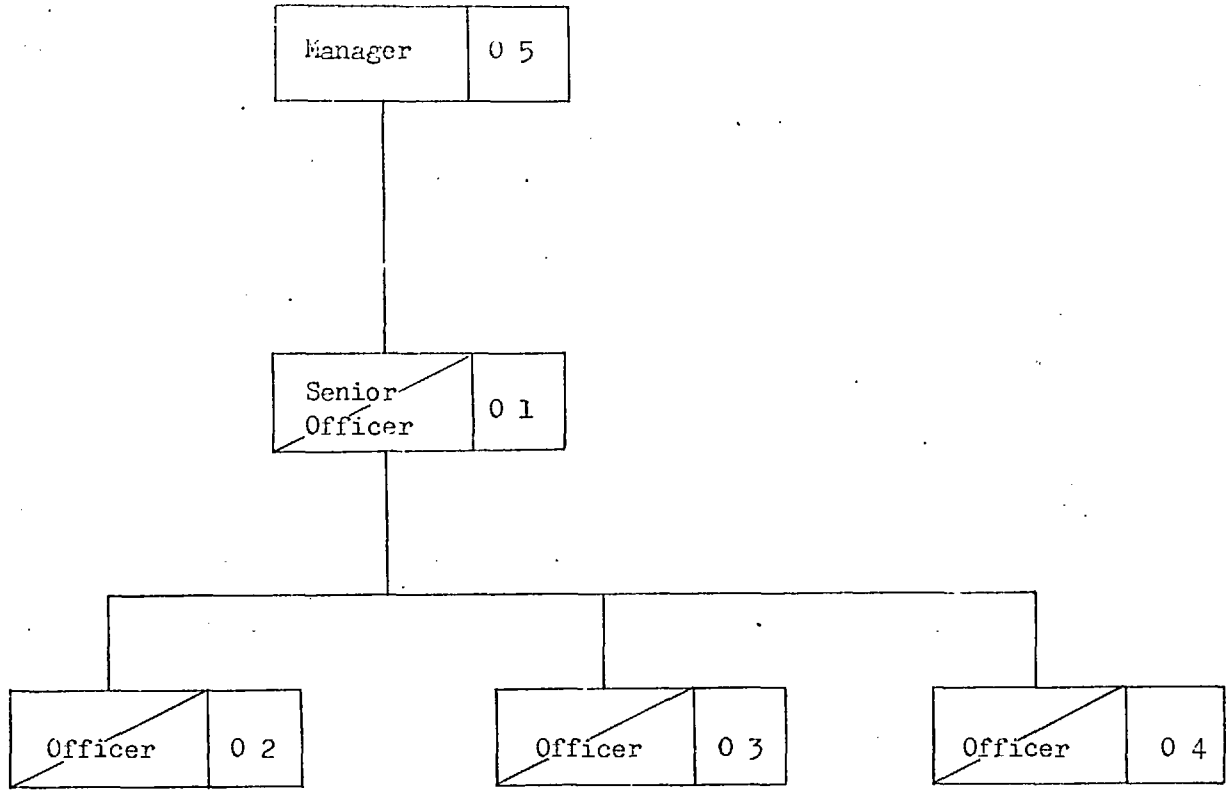
Numbers represent the diary record code numbers for this group . Only those members with a diagonal line returned completed diaries .



Group Structure : Group 0 9 Cargo Division

Numbers represent the diary code numbers for this group .

Numbers 0 4 to 1 4 in the person number code indicate other sections and managers identified within B E A .



Group Structure : Group 1 2 Financial Division

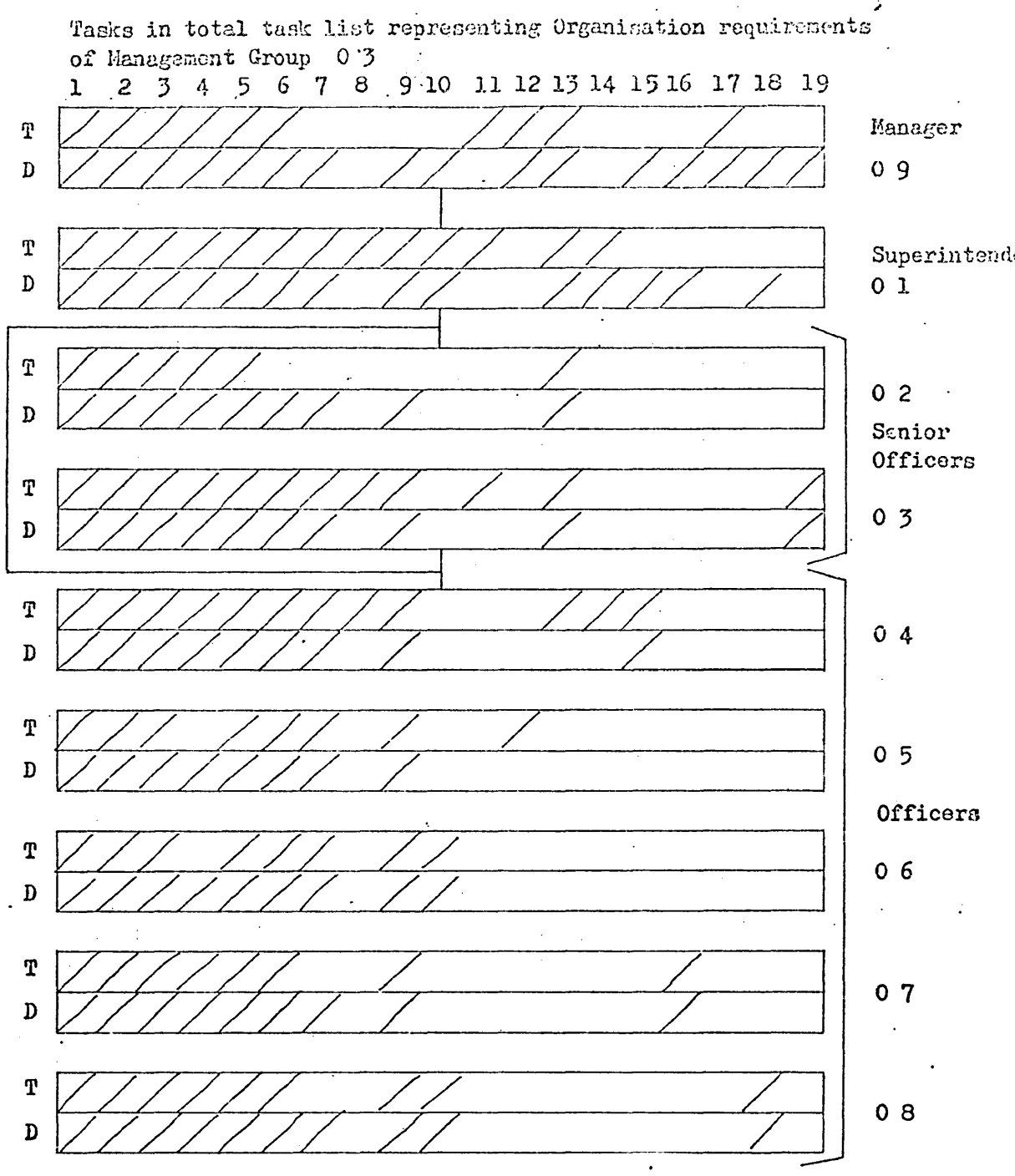
Numbers represent the diary code numbers for this particular group. Only those group members indicated by a diagonal line returned completed diaries.

Group Number	Senior Manager	Manager	Super-Intendent	Senior Officer	Officer	Super-visor
0 1		15 5	8	10	3 3 7 6 14	7 6
0 2		12	9		10	7
0 3		11	14	13 6	13 9 9 9 10	
0 4		22		6	18	
0 5	10	11			9 6	
0 8	12	20 6	6 12 12 9 18 8		11 9	
0 9		18	18 16			
1 2		15		17	12 11 15	
mean number of tasks for each organisation level	11	13.4	11.8	10.4	9.5	6.7

Numbers of Tasks carried out by members of Management Groups classified according to Organisational Status .

Group Number	Senior Manager	Manager	Super-Intendent	Senior Officer	Officer	Super-visor
01		11 4	9	4	0 1 3 7 0	4 1
03		17	15	10 11	10 9 10 10 11	
08	12	14 5	4 3 4 6 1 2		3 3	
09		19	16 17			
12		13		14	6 4 6	
mean no. of tasks in which decision making is exercised	12	11.7	7.7	9.7	6.6	2.5

Numbers of Tasks for each member of Management Groups (classified according to Organisational Status) in which decision - making is carried out .



T : Profile of tasks with which individual members are concerned .

D : Profile of tasks in which individuals take some part in making decisions .

Profiles of task and decision structure related to group organisation structure . Example ,Management Group 0 3

Group Number	Senior Group Member	2nd Level Members	3rd Level Members	4th Level Members	5th Level Members
0 1	15	5 8 10	14 7 6 3 3	7	6
0 2	12	9	10	7	
0 3	11	14	13 6	13 9 9 9 10	
0 4	22	18 6			
0 5	10	11	9 6		
0 8	12	20 6	6 12 12 9 18 8 11 9		
0 9	18	18 16			
1 2	15	17	12 11 15		
mean no. of tasks	14.3	12.2	9.5	9.1	

Number of Tasks carried out by members of Management Groups classified according to Group Status .

Group Number	Senior Group Member	2nd Level Members	3rd Level Members	4th Level Members	5th Level Members
0 1	11	4 9 4	0 1 3 7 0	4	1
0 3	17	15	10 11	10 9 10 10 11	
0 8	12	14 5	4 3 4 6 1 2 3 3		
0 9	19	16 17			
1 2	13	14	6 4 6		
mean no. of tasks in which decision-making is exercised	14.4	10.9	4.1		

Numbers of Tasks for each member of Management Groups (classified according to Group Status) in which decision - making is carried out .

	Member Number	Within Group	Outside Group
Group 0 1	02	14.3	40.3
	05	6.0	41.3
	07	10.9	48.2
	08	9.2	57.1
	11	3.0	66.3
Group 0 2	02	13.1	30.0
	03	0	28.0
Group 03	01	46.6	33.0
	03	1.0	0
	04	14.4	20.6
	05	11.1	19.1
	06	0	17.7
	07	0	30.2
	08	10.6	7.4
	09	15.3	21.0
Group 0 4	01	19.6	25.5
	02	6.9	48.2
	03	5.2	55.3
Group 05	01	43.6	23.1
	03	15.3	27.4
	04	49.4	47.0
Group 0 8	01	6.5	27.4
	02	17.4	58.6
	03	22.2	33.3
	04	23.3	73.3
	05	45.2	50.0
	07	14.9	78.1
	10	12.2	40.5
	11.	14.8	44.7

	Member Number	Within Group	Outside Group
Group 0 9	01	11.5	72.7
	02	11.1	71.7
	03	10.0	22.1
Group 1 2	01	25.o	31.8
	02	9.9	38.0
	03	3.3	32.6
	04	12.9	33.5

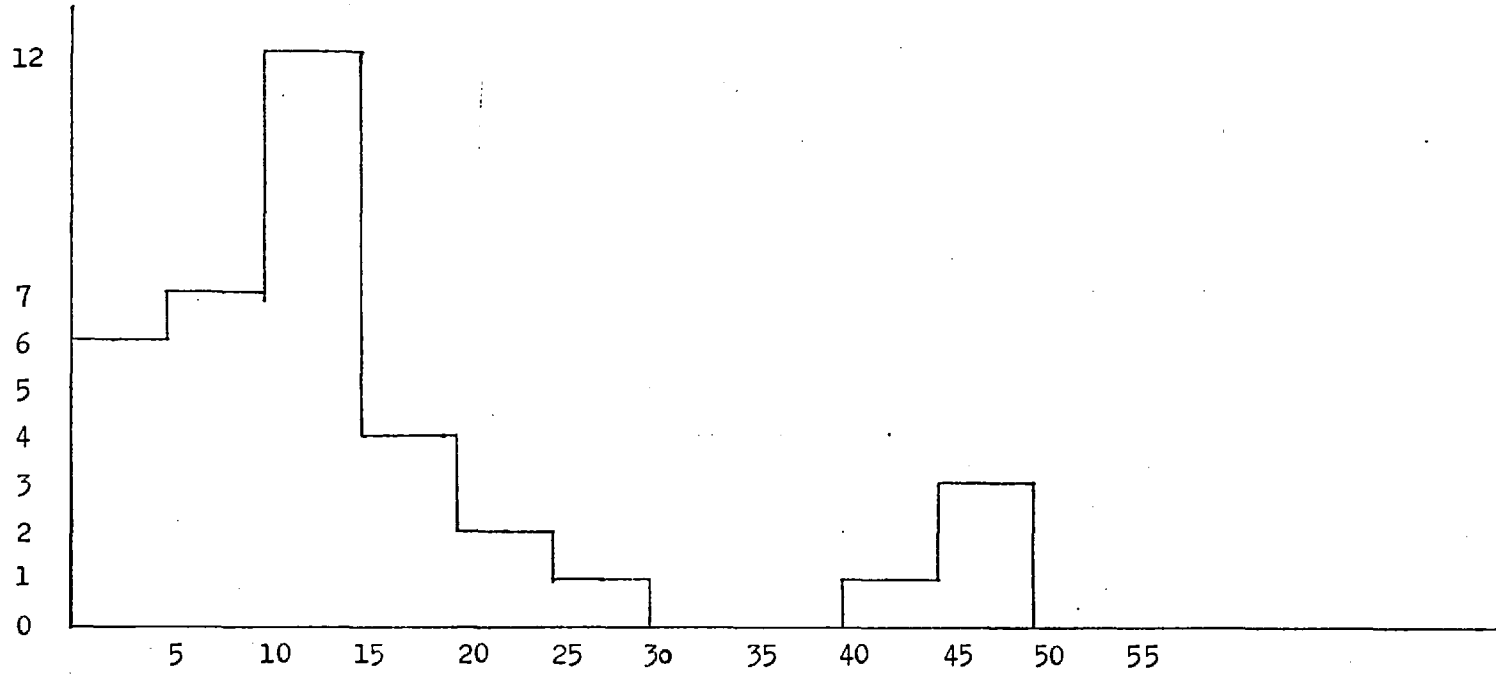
Numbers of contacts made by members of groups - both within the defined Management Group and with people outside the group - per. 100 diary episodes .

DISTRIBUTION OF MANAGEMENT GROUP MEMBERS CONTACT WITH ALL OTHER PERSONS

Histogram : Total number of contacts with other people

GROUP MEMBERS CONTACT WITHIN /OUTSIDE THE MANAGEMENT GROUP

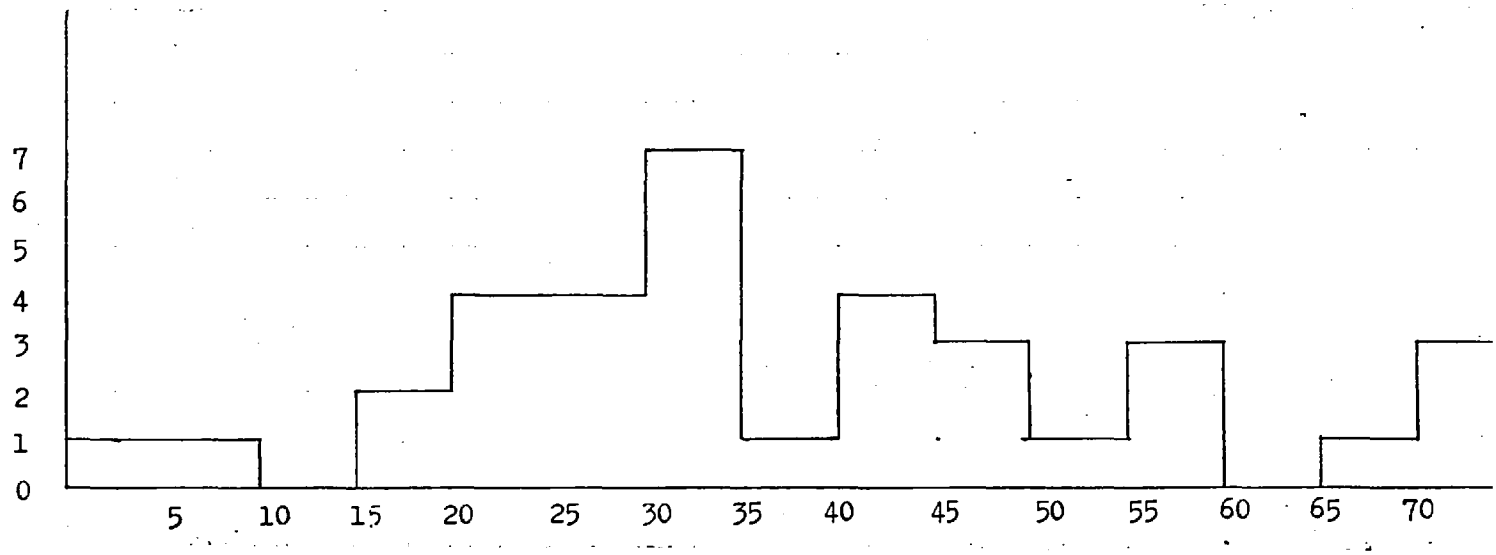
Number of Group Members with specific contact per 100 Episodes



Total number of contacts made with other members of the management group per. 100 Episod

Histogram: Contacts within the Management Group

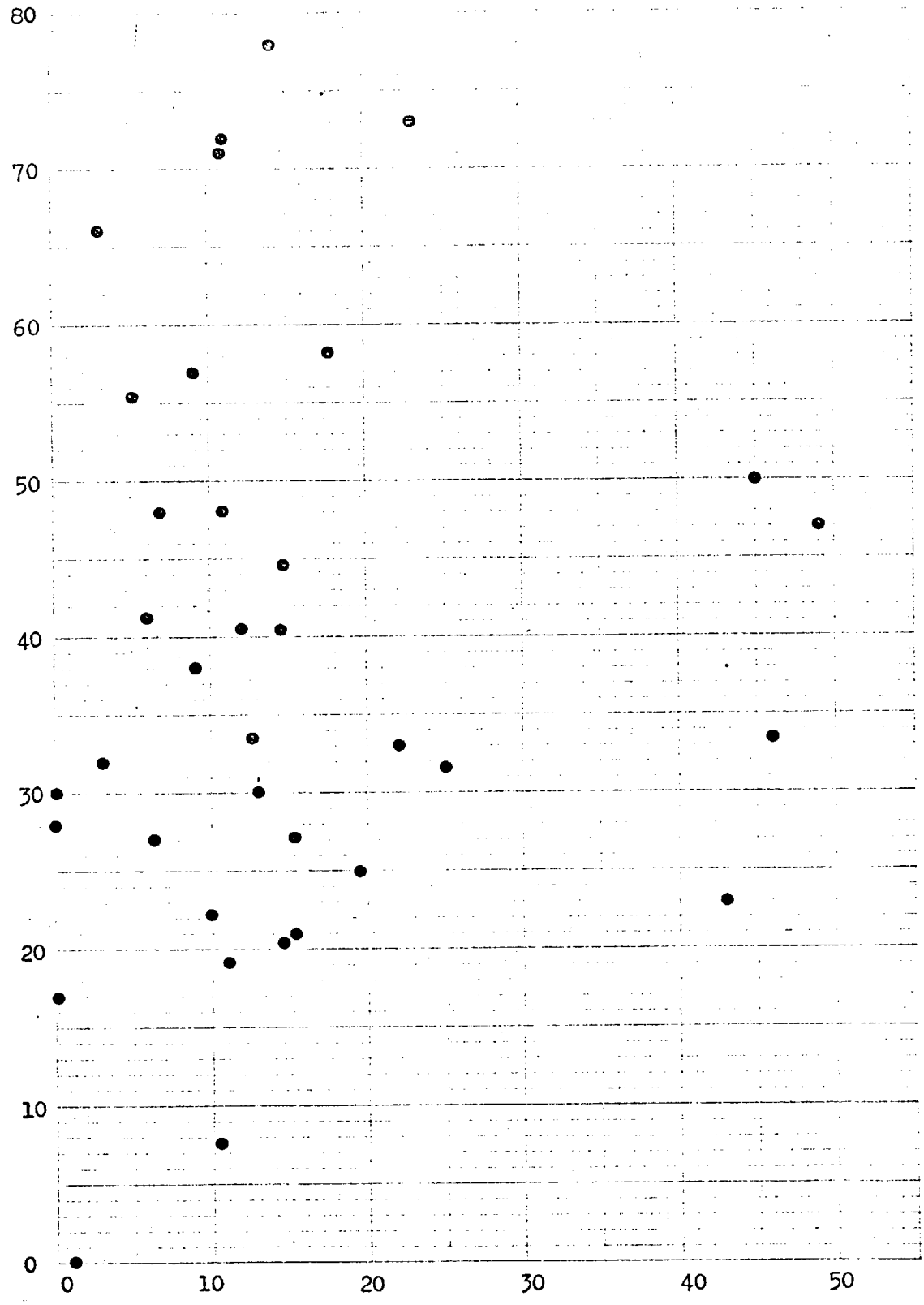
Number of group members with specific contact per 100 Episodes



Total number of contacts made with people other than group members per. 100 Episodes

Histogram : Contacts outside the Group

Number of contacts with people outside the particular management group per. 100 recorded episodes .



Number of contacts within the management group per 100 recorded episodes

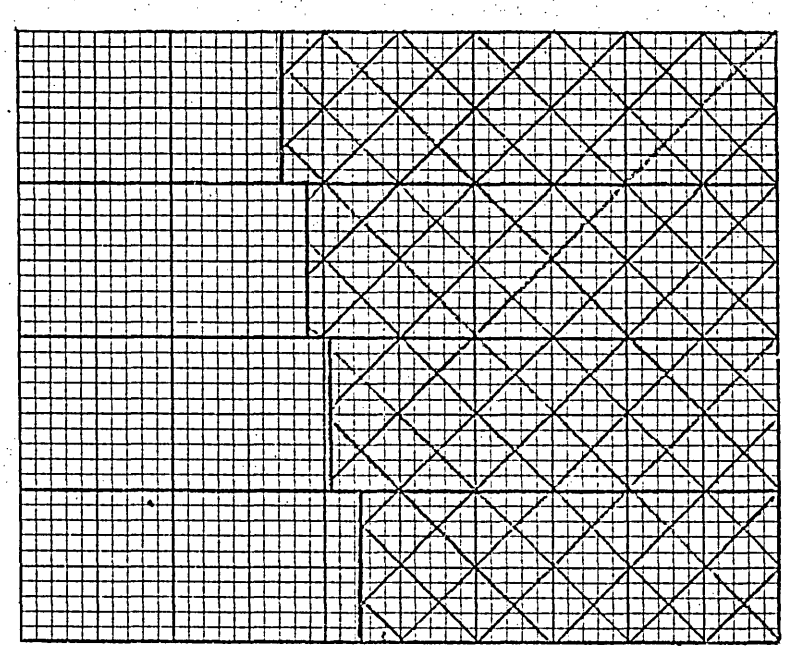
Number of contacts within the group compared with the number of contacts with people outside the management group for each member taking part in the diary recording study .

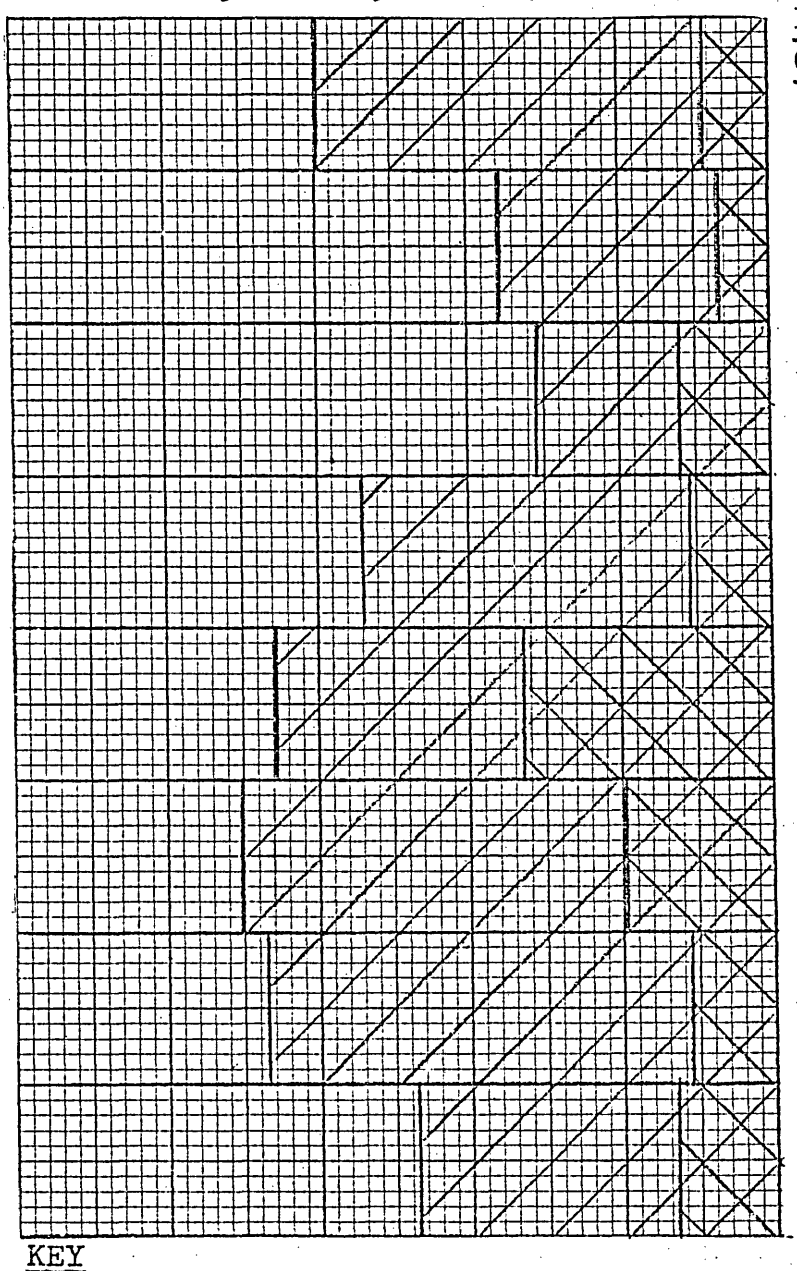
Analysis of Variance : Frequency of episodes in which Group Members were identifed as being in contact with a person who was not a member of the organisational group under study .

	degrees of freedom	Sum of Squares	Mean Square (Variance)
Between Groups	7	7,818	1,117
Within Groups	28	13,165	470

F Ratio is 2.38 (value of F needed for statistical significance at 0.05 level is 2.32)

70.4 % of the total variance is associated with factors common to particular management groups .





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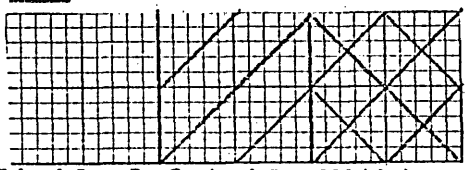


Individual Outside Within Group Interaction

Comparison of the frequencies of Individual and Interactive in Simulated and Real Groups.

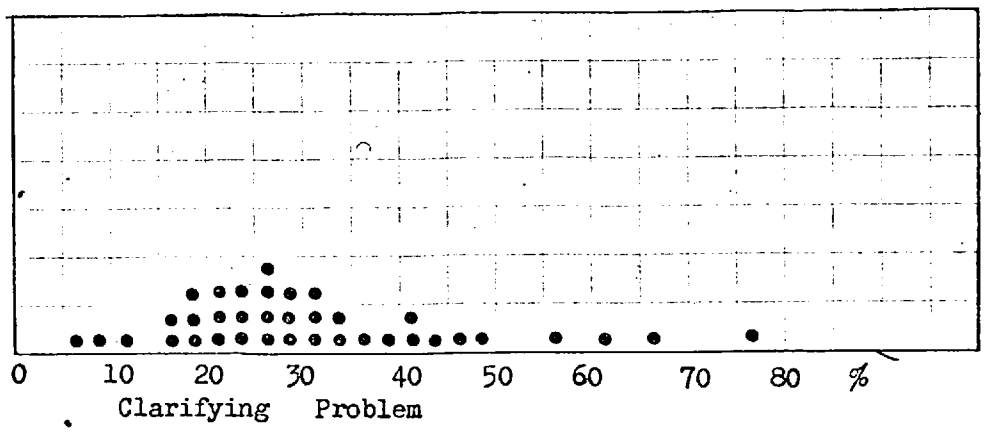
Percentage Frequencies of Decision-making and Control Activity Categories in all management group member diary records

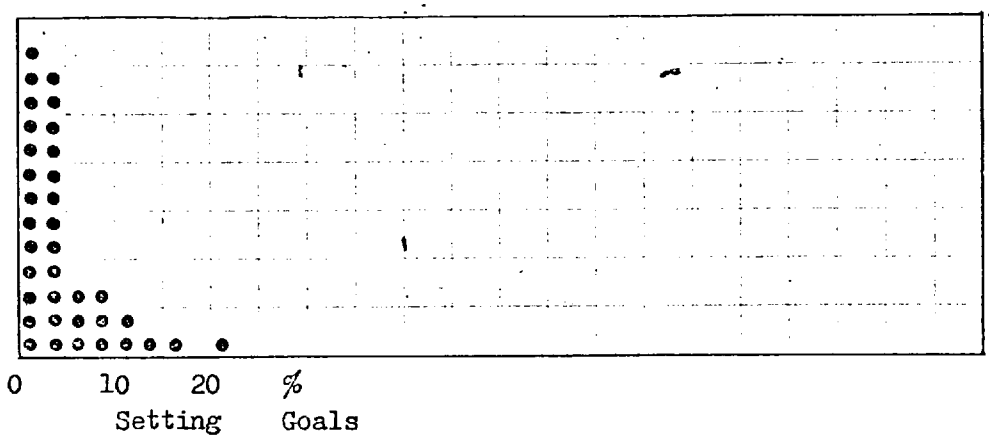
mgmt. group nos.	Decision-making and Control Activities				
	CP	SG	IA	IO	EO
12	63.7	4.5	31.8	14.4	9.9
	36.6	1.4	15.5	7.0	0
	45.1	8.8	36.3	35.2	35.2
	65.8	1.3	17.4	8.4	8.4
09	24.8	1.8	4.8	5.5	3.6
	24.7	8.5	18.8	7.7	0.9
	10.0	4.3	15.0	0	2.1
01	25.4	0.8	38.9	15.9	9.5
	34.3	5.0	11.1	0	0
	20.0	20.9	13.6	7.3	8.2
	28.6	0	26.9	0	8.4
	30.0	0.4	22.1	8.7	3.6
02	5.3	0	2.6	5.3	0
	25.2	0	18.0	0	0
04	19.6	5.9	2.0	3.9	3.9
	6.9	0	3.4	0	0
	21.0	14.5	11.8	1.3	3.9
03	45.4	0	15.9	2.3	2.3
	15.3	0	0	0	0
	22.5	0	3.8	0	0
	33.0	0	4.2	0	0
	39.2	0	13.7	5.9	3.9
	26.4	11.3	9.4	0	0
	21.7	0	16.1	0	1.2
	76.3	1.8	37.7	4.4	8.8
05	29.9	0	2.6	1.7	3.4
	18.9	3.6	15.3	6.3	7.2
	31.6	0	20.3	8.9	7.6
08	32.2	0	1.6	0	0
	19.0	0	12.1	0	10.3
	15.9	0	11.1	12.7	9.5
	2o.0	16.3	16.7	0	0
	46.5	7.0	36.0	5.8	7.0
	58.8	13.2	32.4	22.8	22.8
	40.5	0	24.3	6.7	6.7
	31.3	3.3	28.0	2.7	8.0

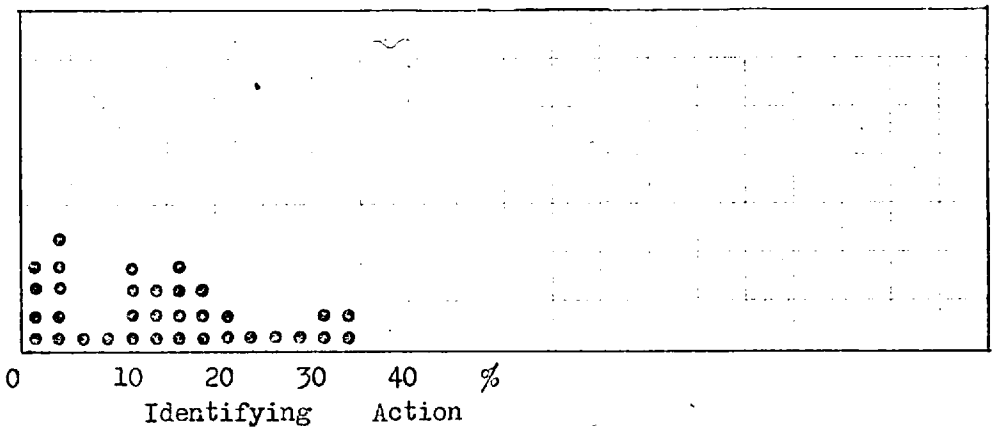
Decision-making and Control Activities (cont.)

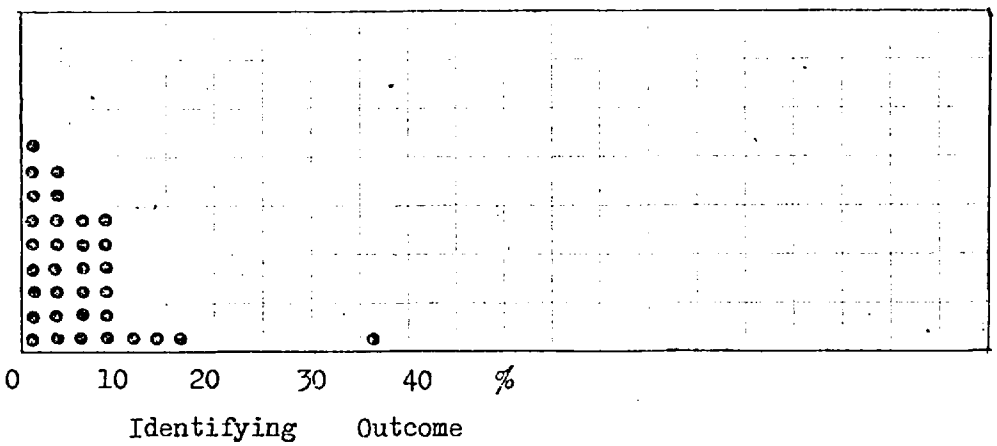
mgmt. group nos.	CA	E.A	S	D	SS	NF
12	22.0	34.1	2.3	3.8	11.4	7.6
	5.6	32.4	2.8	0	2.8	15.5
	30.8	51.7	1.1	1.1	9.9	16.5
	19.4	32.9	2.6	0	2.0	1.9
09	5.5	62.4	8.5	1.2	0	0
	35.9	53.9	2.6	0	0	6.8
	10.0	35.0	7.9	2.9	0	5.7
01	38.9	42.1	17.5	0	0.8	6.4
	9.1	66.7	2.0	0	0	0
	12.7	23.6	6.4	7.3	1.8	10.8
	37.8	50.4	3.4	0	0	16.0
	17.7	50.0	0	0	0	4.3
02	32.9	50.0	25.0	0	11.8	7.9
	18.0	45.9	21.6	0	0	21.6
04	11.8	39.2	0	2.0	0	15.7
	48.3	3.4	17.2	0	0	20.7
	15.8	5.3	9.2	6.6	6.6	0
03	21.6	23.9	0	0	2.3	12.5
	1.0	21.9	0	0	0	10.2
	15.0	21.9	11.9	4.4	1.3	23.1
	27.9	41.5	9.3	2.5	0	26.2
	19.6	35.3	9.8	11.8	0	11.8
	5.6	24.5	7.5	1.9	0	20.8
	6.8	26.1	14.9	16.8	0.6	27.9
	28.1	39.5	8.8	2.6	1.8	0.9
05	2.6	50.4	2.6	0	1.7	6.8
	18.9	46.9	11.7	0	0	9.1
	13.9	7.6	0	0	1.3	5.1
08	14.5	43.6	9.7	1.6	3.2	14.5
	12.1	55.2	0	0	0	5.2
	20.6	17.5	14.3	3.2	0	38.1
	30.0	13.3	3.3	3.3	3.3	0
	19.8	26.7	0	1.2	19.8	2.3
	25.4	62.3	3.5	8.7	7.8	20.2
	24.3	44.6	12.2	1.4	1.4	6.8
	16.0	28.7	2.7	2.7	1.3	13.3

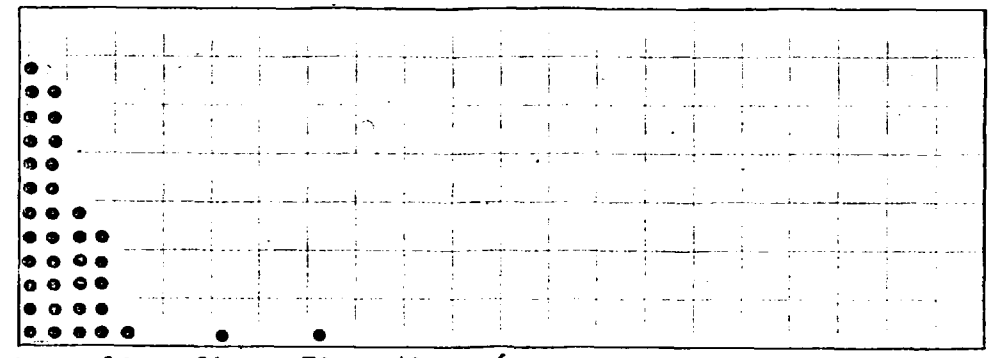
Frequency Distribution of the Percentage occurance of Categories of Decision - Making in the Diary Records for Individuals

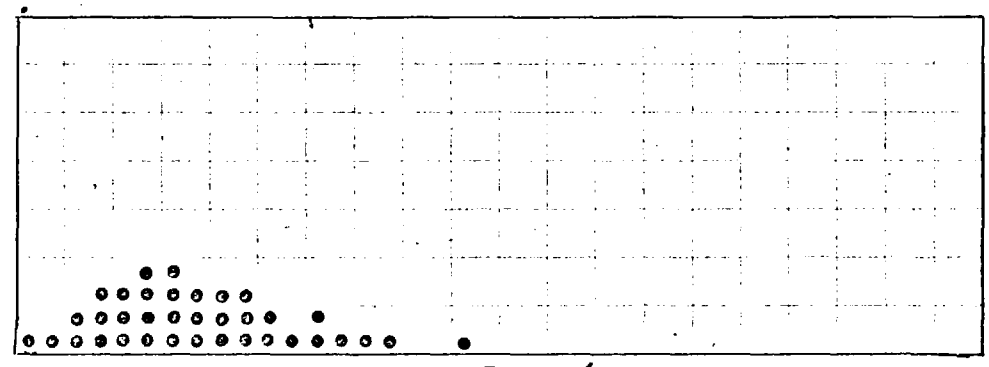


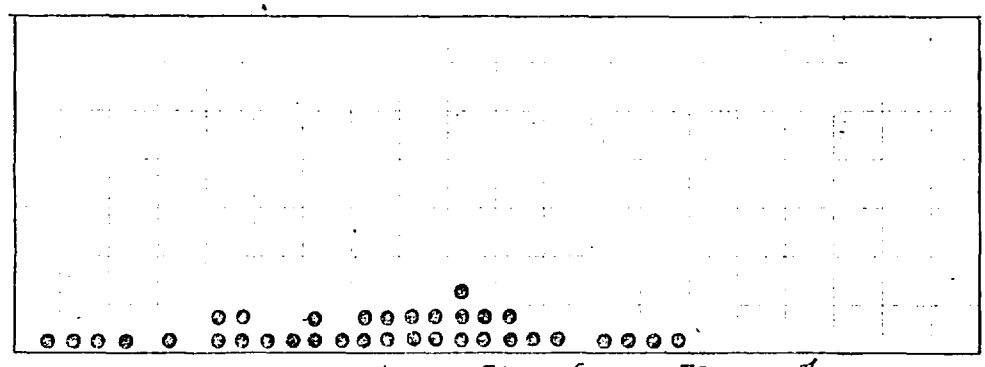







0 10 20 30 40 %
Evaluating Outcome


0 10 20 30 40 50 %
Choosing Action


0 10 20 30 40 50 60 70 %
Effecting Action

Summary Statistics for frequency of Decision - Making categories in the Episodes recorded in Individual Diaries .

Clarrifying Problem

SAMPLE MEAN VALUE	30.8778
VARIANCE OF SAMPLE	255.668
SAMPLE STD DEVIATION	15.9896
ESTIMATED POPN STD DEV	16.2164
STANDARD ERROR OF MEAN	2.70274

Identifying Action

SAMPLE MEAN VALUE	16.4222
VARIANCE OF SAMPLE	123.591
SAMPLE STD DEVIATION	11.1171
ESTIMATED POPN STD DEV	11.2748
STANDARD ERROR OF MEAN	1.87914

Choosing Action

SAMPLE MEAN VALUE	18.8353
VARIANCE OF SAMPLE	115.501
SAMPLE STD DEVIATION	10.7471
ESTIMATED POPN STD DEV	10.9087
STANDARD ERROR OF MEAN	1.87083

Effecting Action

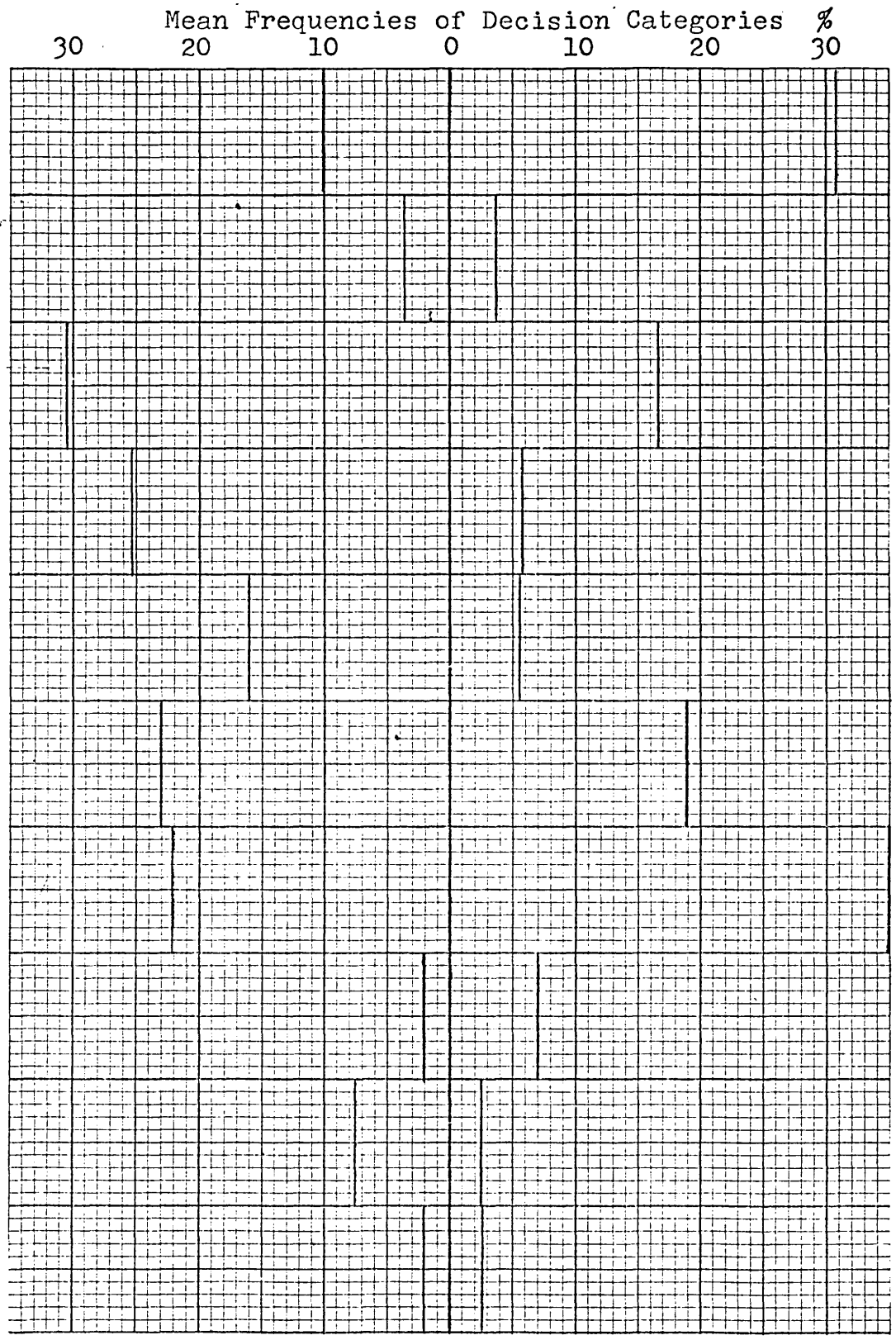
SAMPLE MEAN VALUE	37.6889
VARIANCE OF SAMPLE	278.292
SAMPLE STD DEVIATION	16.6821
ESTIMATED POPN STD DEV	16.9187
STANDARD ERROR OF MEAN	2.81979

Non - Functional Activity

SAMPLE MEAN VALUE	11.45
VARIANCE OF SAMPLE	79.9281
SAMPLE STD DEVIATION	8.94025
ESTIMATED POPN STD DEV	9.06707
STANDARD ERROR OF MEAN	1.51118

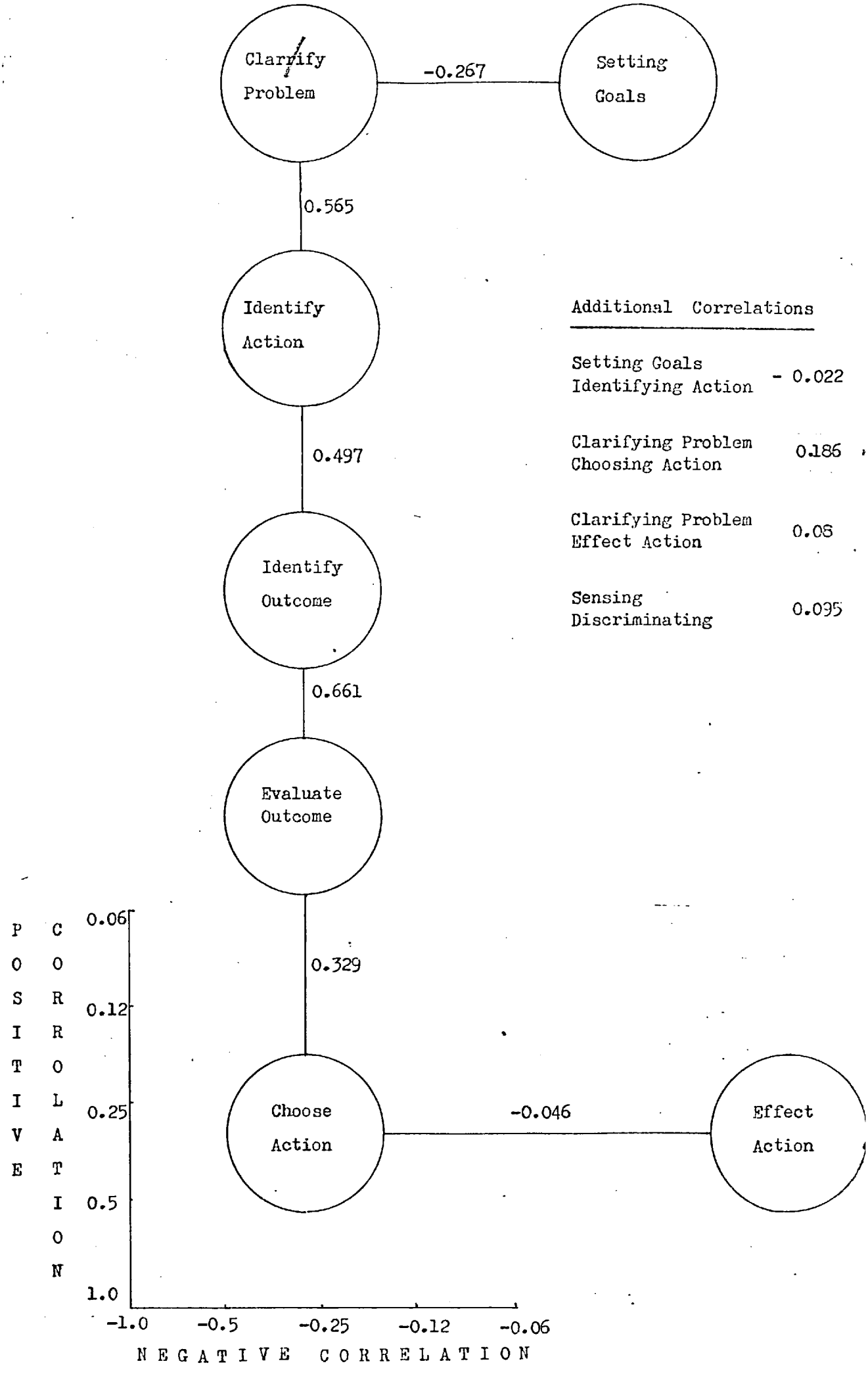
BTA Exercise Groups
Observation Records

Management Groups
Diary Records



Comparison of the Decision-making and Control Category Profiles Obtained from the Simulation Study and the Management Group Studies

Spearman Rank Correlation Coefficients

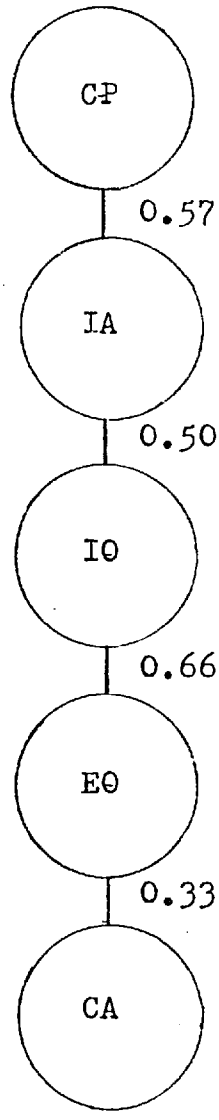


Additional Correlations

Setting Goals Identifying Action	- 0.022
Clarifying Problem Choosing Action	0.186
Clarifying Problem Effect Action	0.08
Sensing Discriminating	0.095

Summary comparison of the main correlations between the Frequencies of Decision-making and Control Activity associated with Individuals for the two populations of Simulation and Management Group Members .

Management Group
rho correlations



BTA Exercise Group
rho correlations

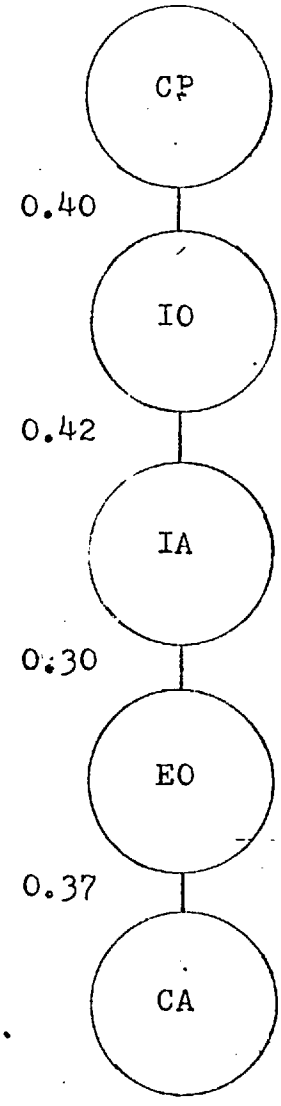


TABLE 1

Mean Group Frequencies of Categories in the Model of Decision-making Activity

CP	SG	IA	IO	EO	CA	EA	S	D	SS	NF
52.8	4.0	25.2	16.2	13.4	19.4	37.8	2.2	1.2	6.7	10.4
19.8	4.9	12.9	4.4	2.2	17.1	50.4	6.3	1.4	0	4.2
27.7	5.4	22.5	6.4	4.9	23.2	46.6	5.8	1.5	0.5	7.5
15.2	0	10.3	2.6	0	25.4	48.0	23.3	0	5.9	14.7
15.8	6.8	5.7	1.7	2.6	25.3	16.0	8.8	2.7	3.3	12.1
35.0	1.6	12.6	1.6	2.0	15.7	35.1	7.8	5	0.75	16.7
26.8	1.2	12.7	5.6	6.1	11.8	35.0	4.8	0	1.0	7.0
33.0	5.0	20.3	6.3	8.0	20.3	36.5	5.7	2.8	4.6	12.5

Within and Between Group Variance of Frequencies of Activity

A N A L Y S I S O F V A R I A N C E

SOURCE	SUM SQUARES	DF	MEAN SQUARE
ROW MEANS	534.364	7	76.3378
COLUMN MEANS	11024.5	9	1224.95
RESIDUAL	2523.09	63	40.0491
TOTAL	14082.	79	

F RATIOS

ROW MEANS (VARIANCE BETWEEN MANAGERIAL GROUPS) is 1.906

For df 7 / 63 F value of greater than 2.16 is necessary for Statistical Significance at 0.05 Level .

Hence the variance is just short of Statistical Significance .

COLUMN MEANS (VARIANCE WITHIN MANAGERIAL GROUP BEHAVIOURS) is 30.59

For df 9 / 63 F value of greater than 2.70 is necessary for Statistical Significance at 0.01 Level .

Hence the variance between Benaviour categories in all managerial groups is highly significant .

F test with data from individuals in eight management group relating to the frequencies of those decision-making and control activity which have distributions approximating to normal .

Clarifying Problem

	df	SS	Mean Square	F ratio
Between Groups	7	3791	541	3.01
Within Groups	28	5051	180	

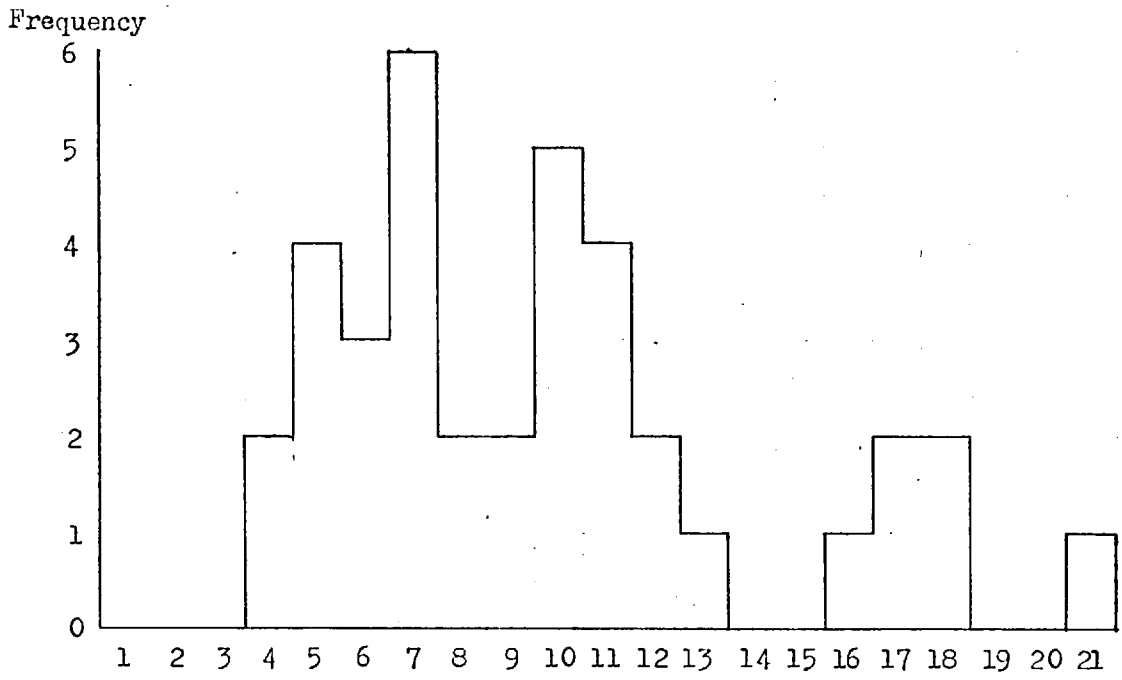
Choosing Action

	df	SS	Mean Square	F ratio
Between Groups	7	568	81.1	0.57
Within Groups	28	3966	142	

Effecting Action

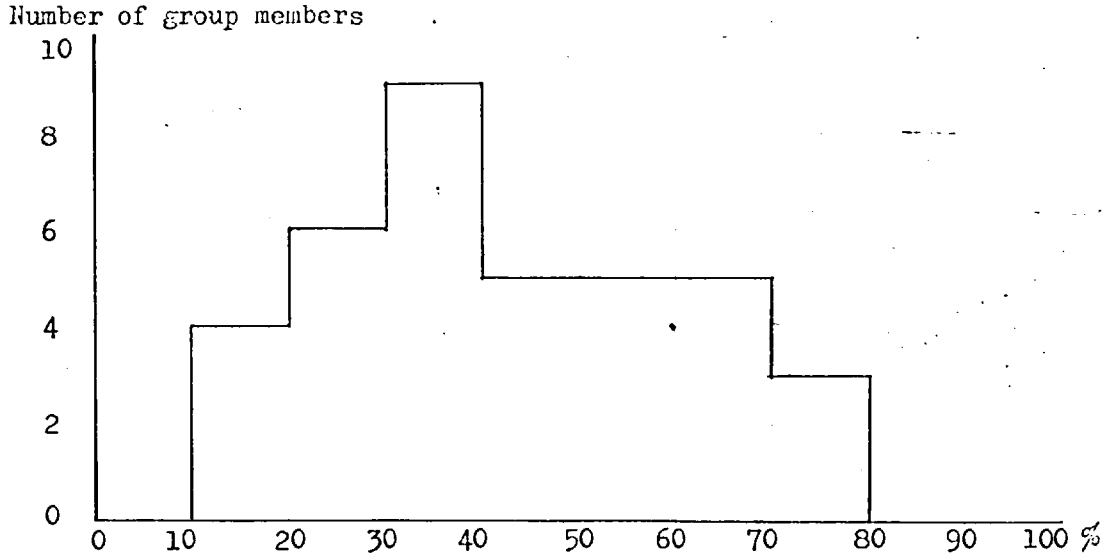
	df	SS	Mean Square	F ratio
Between Groups	7	3072	438	1.90
Within Groups	28	6443	230.1	

Value of F ratio needed for significance at 0.05 level is 2.33 (df 7,28)



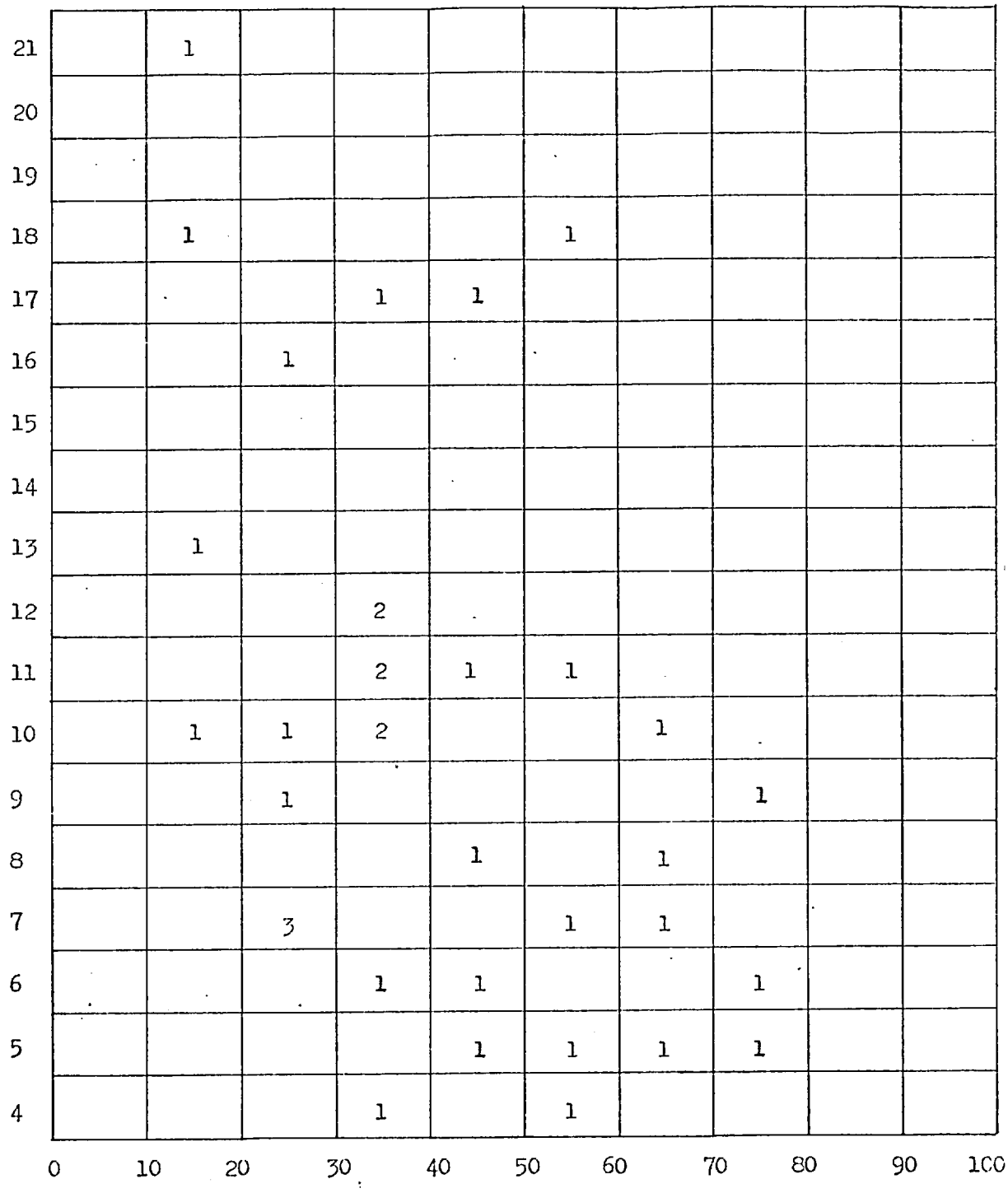
Total Number of Tasks used by Group Members during Diary - Keeping

APPENDIX 14.16



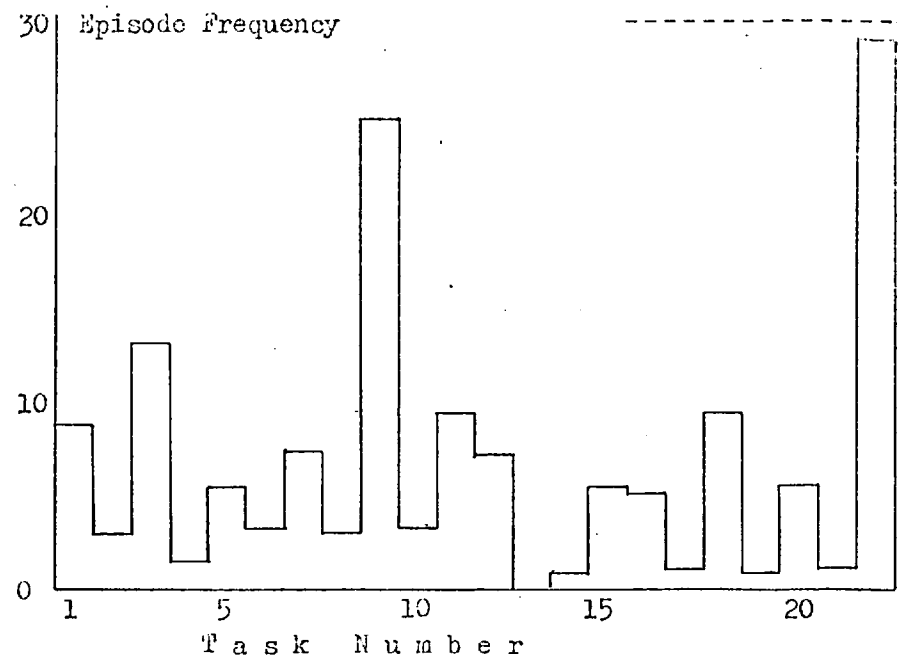
Frequency of the most used task category for each individual as a percentage of the total number of diary episodes for that person

Number of tasks used by Group Member during diary - keeping



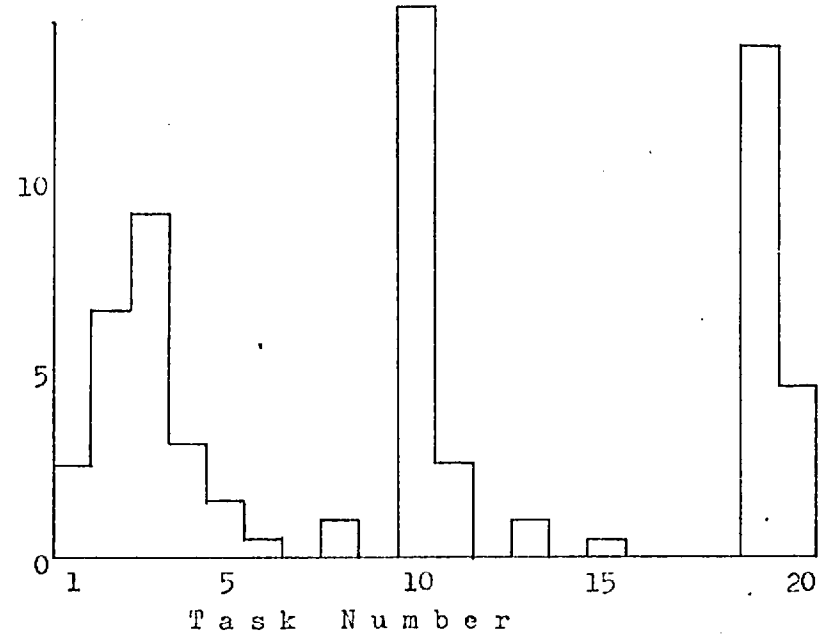
Frequency of the most used task category for each individual as a per centage of the total number of diary episodes for that person

Relationship between frequency of a single task carried out by Group Members and the total number of tasks that individual identified during the group activity study .



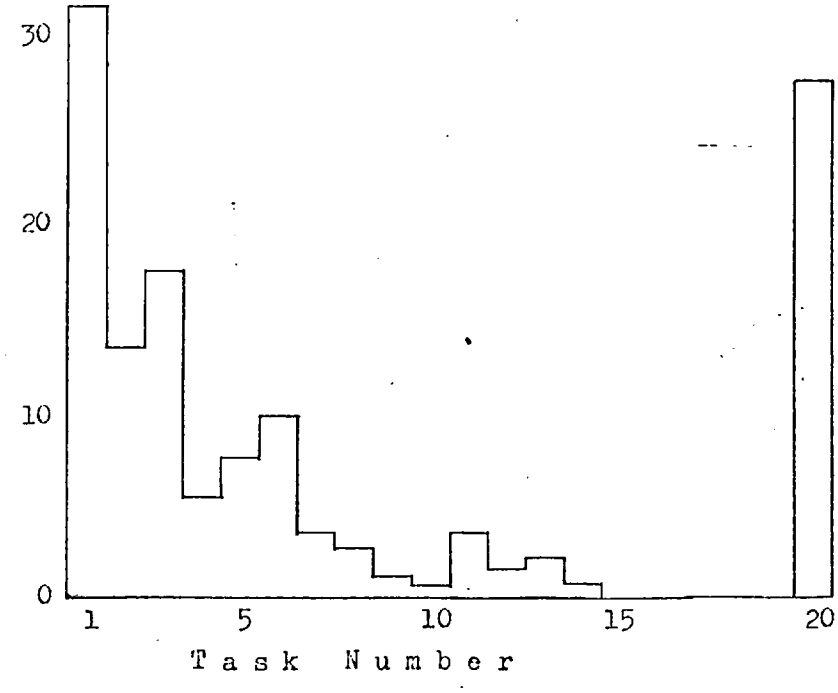
Group 01

5 Diaries



Group 02

2 Diaries



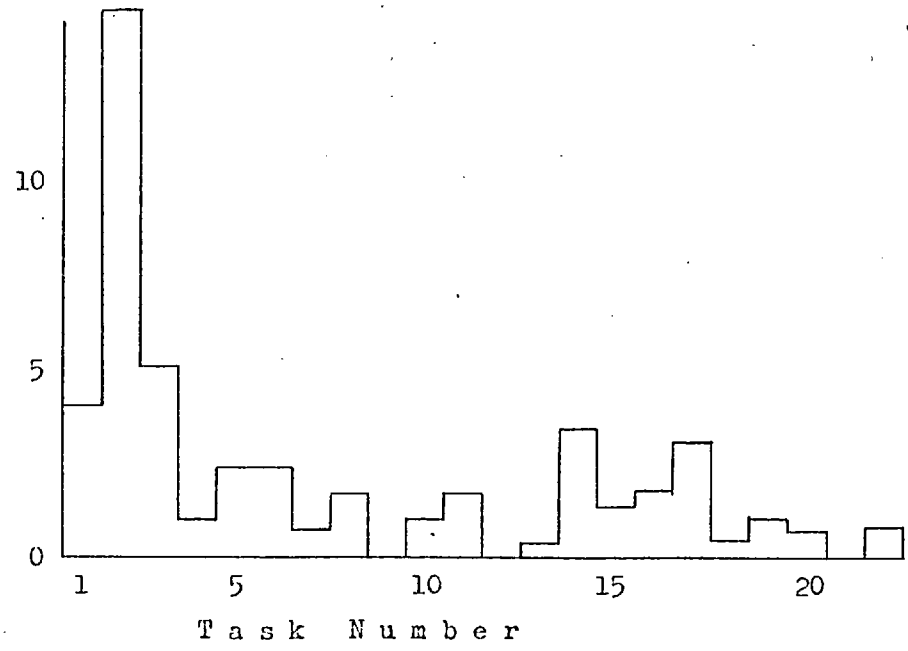
Group 03

8 Diaries

Frequency of the various tasks associated with episodes in the diary records for the management groups .

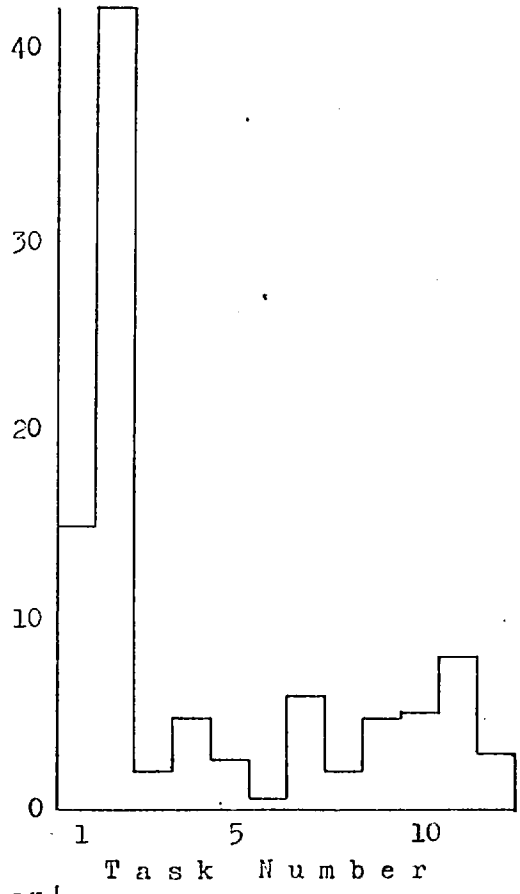
Group 04

3 Diaries



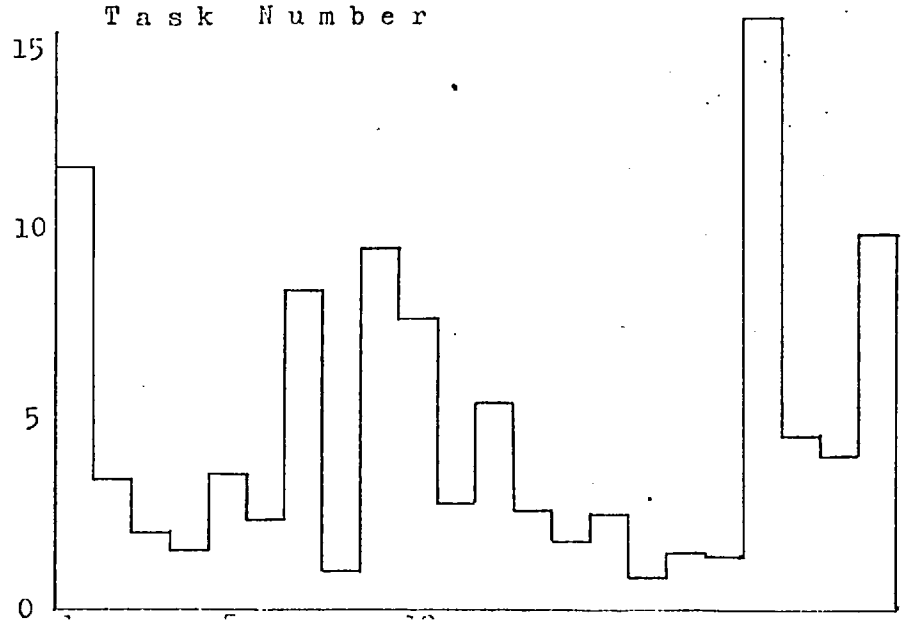
Group 05

3 Diaries



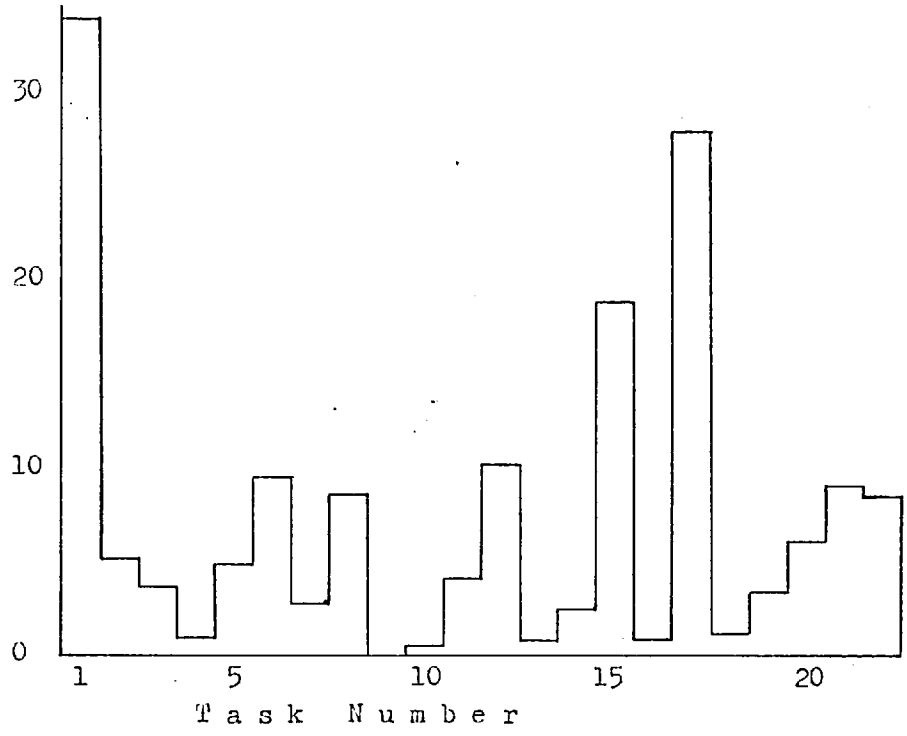
Group 08

8 Diaries



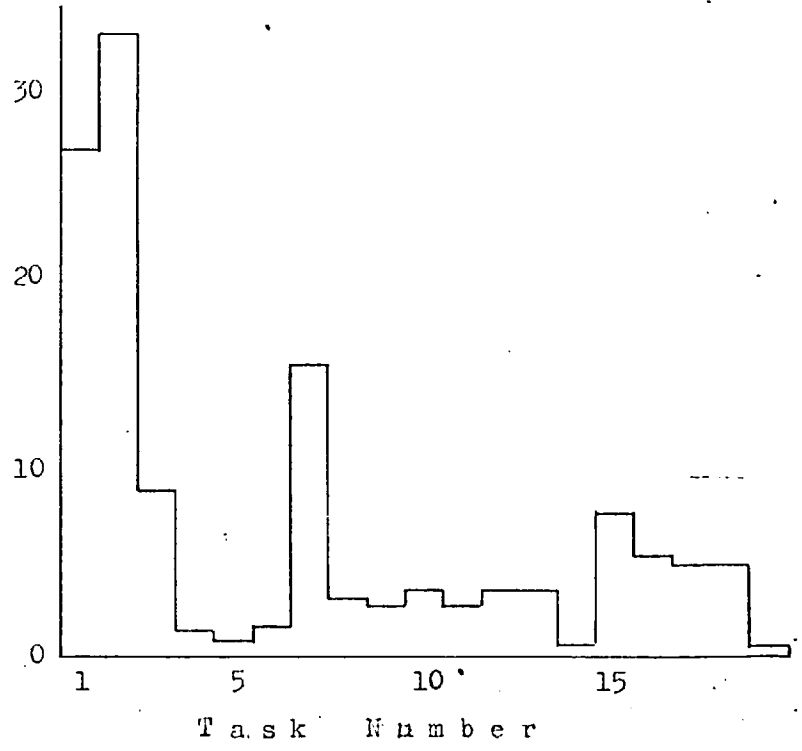
Group 09

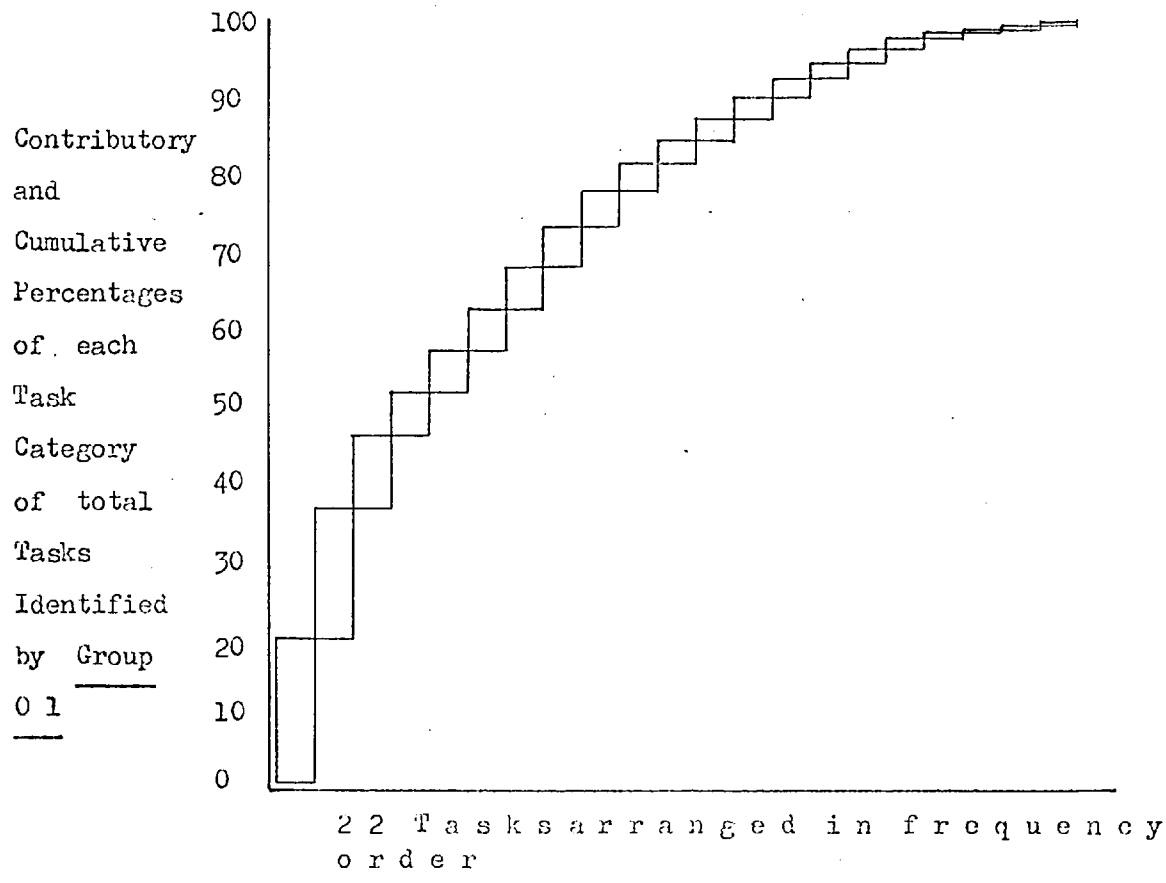
3 Diaries

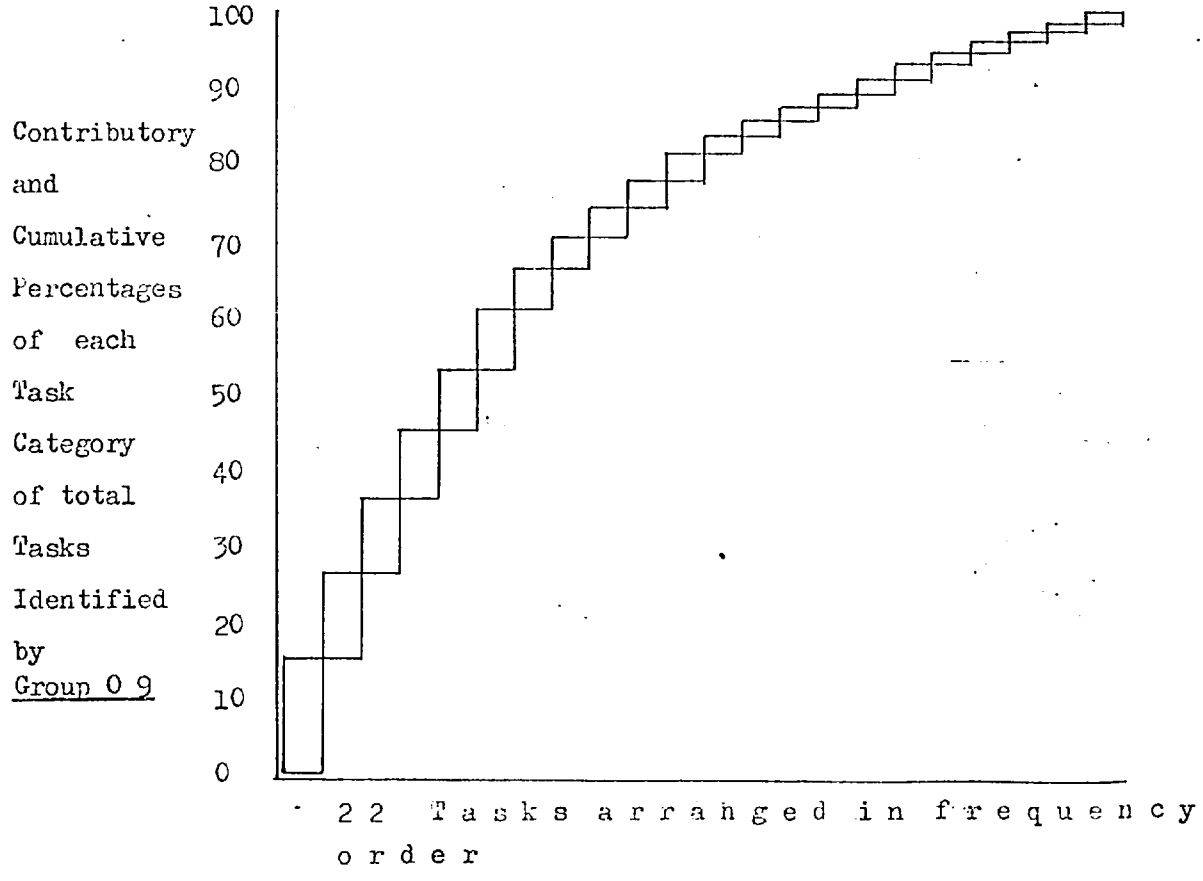


Group 12

4 Diaries




Contributory and Cumulative Percentages of each Task Category of total Tasks Identified by Group 0 1
100
90
80
70
60
50
40
30
20
10
0
22 Tasks arranged in frequency order


Contributory and Cumulative Percentages of each Task Category of total Tasks Identified by Group 0 9
100
90
80
70
60
50
40
30
20
10
0
22 Tasks arranged in frequency order

Group No.	Member No.	List of Task Numbers 1	2	3	4	5	6	7	8	9	10	11
01	01							4.8			1.6	3.2
	05	2.0	1.0	53.5				15.2				
	07	11.8		12.7	4.5	11.8	3.6	12.7		1.8	3.8	2.7
	08	22.7	10.8	14.3	3.4	11.8	10.1					
	11							0.4	5.1	43.5	4.0	14.5
02	02	21.1		19.7	6.6	3.9	1.3		2.6		30.3	6.6
	03	17.1	11.7	2.7	0.9						5.4	
03	01	17.4	9.1	7.9		3.4	4.5	2.3	2.3	1.6	2,3	13.6
	03	11.2	2.2	16.3	7.1	5.1	5.1	4.1	1.0	1.0		
	04	25.6	16.3	3.7		13.7	25.6			1.9		
	05	44.1	2.5	14.4	5.1	1.7	12.7	6.8	4.2	0.8		
	06	29.4	29.4				5.9	2.0		2.0		
	07	47.4	34.0	1.9		18.8	20.8					
	08	27.3	8.1	37.9	9.3							
	09	37.7	10.5	23.7	12.3	14.9	10.5	11.4	8.8			
04	01	5.9	41.2	17.6		7.8					2.0	
	02	13.7	58.6	6.9								
	03	6.6	6.6	5.3	3.9	5.3	10.6	2.6	6.6		2.6	6.6
05	01		77.8					7.7		0.9	1.7	
	03	39.6			11.7	5.4				9.9	6.3	19.8
	04		44.3	7.6	1.3	1.3	1.3	11.4	7.6	2.5	7.6	2.5
		1	2	3	4	5	6	7	8	9	10	11

Frequency of each task category in the group task lists for each group member keeping diary records of episodes expressed as a percentage of all episodes .

List of Task Numbers (continued)

12	13	14	15	16	17	18	19	20	21	22	Total
		1.6	2.3	18.3	4.8	36.5	1.6	22.2	4.0	13.5	135.1
										44.4	116.1
										19.1	84.3
										22.7	95.9
13.0										12.3	92.8
	2.6		1.3				6.6	1.3			103.9
							19.8	7.2			64.8
	11.4	2.3						12.5			90.6
	5.1							55.1			119.5
								16.2			103.0
								16.5			108.8
								43.1			111.8
											122.7
											82.6
10.5	0.8										155.1
		3.9			5.9			2.0			86.3
						3.4					82.6
	1.3	10.6	5.3	6.6	7.9		3.9	1.3	2.6		96.2
2.6											90.7
											92.7
7.6											103.8

12	13	14	15	16	17	18	19	20	21	22	Total

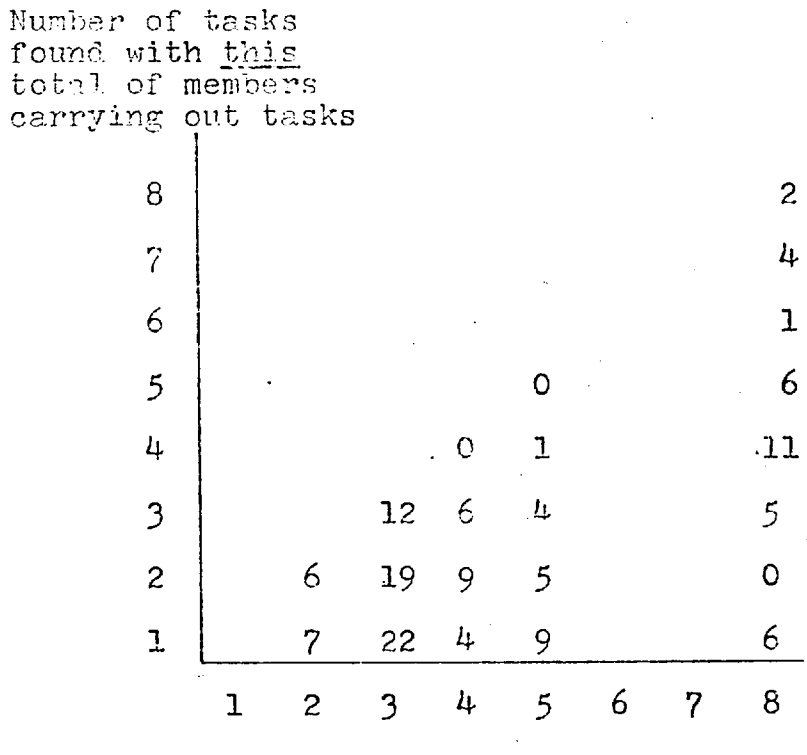
Group No.	Member No.	List of Task Numbers 1	2	3	4	5	6	7	8	9	10	11
08	01	1.6								1.6	9.7	1.6
	02						8.6	3.4			56.9	6.9
	03	4.8		4.8	3.2	34.9						1.6
	04	26.7	10.0	16.7			3.3			3.3	10.0	
	05	8.1	13.9	8.1	2.3	2.3	8.1	11.6	8.1	1.2	8.3	16.6
	07	64.0	4.4		0.9	1.7				63.1	1.7	
	10							68.9			9.4	
	11		4.0	0.7	4.7	1.4	3.3	1.4			1.4	2.0
09	01	25.4	2.4		1.2		1.2	1.2			0.6	3.6
	02	18.8	9.4	9.4		1.7		1.7	21.4			
	03	26.4				5.7	18.6	2.9				
12	01	34.1	7.6	15.9	4.5	0.8		3.8	6.8	2.2	10.6	6.8
	02	76.1		7.0							1.4	
	03					2.2		63.0	4.3	9.8		
	04	3.9	76.8	5.8			4.5					
		1	2	3	4	5	6	7	8	9	10	11

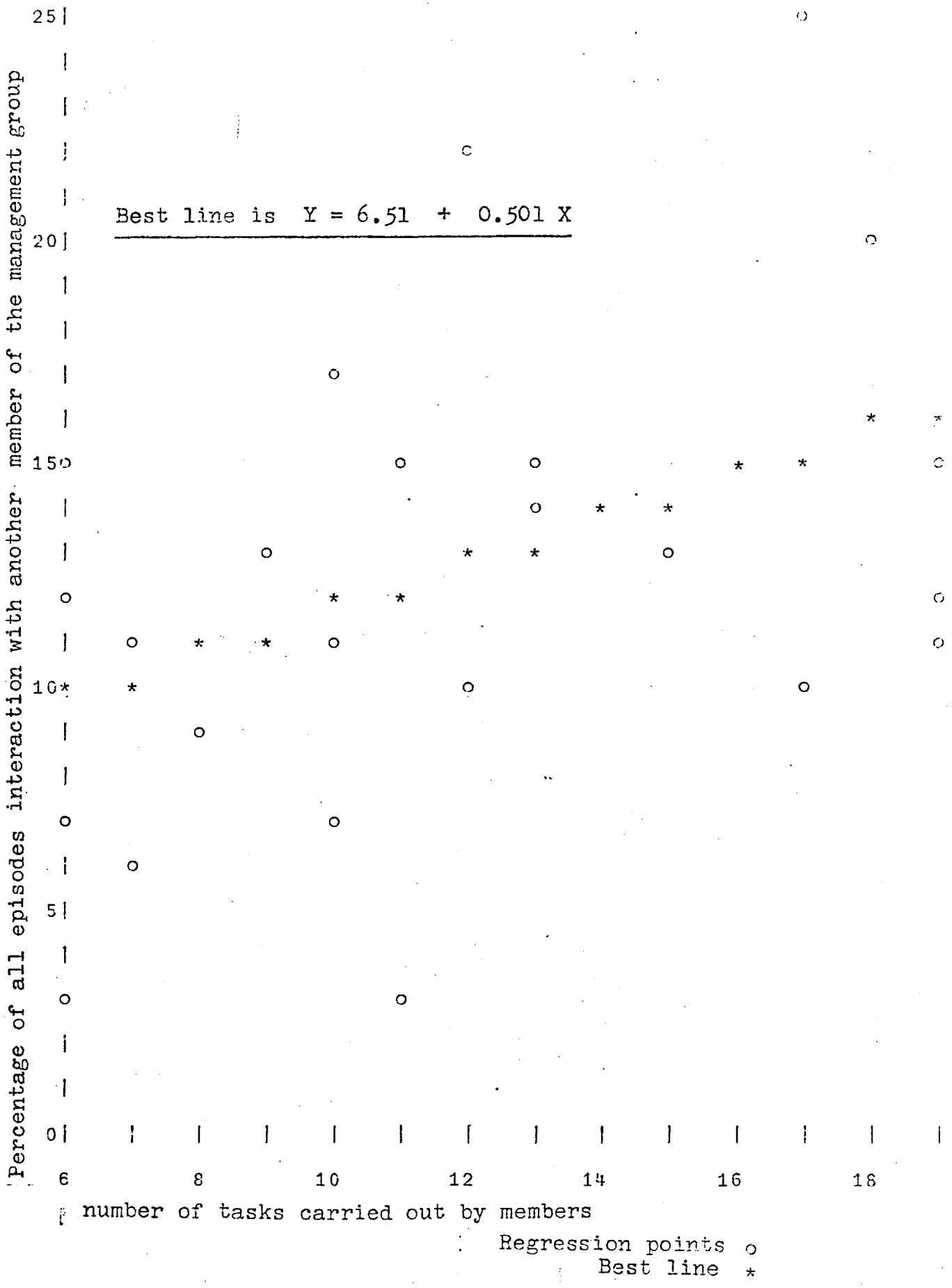
List of Task Numbers (continued)

12	13	14	15	16	17	18	19	20	21	22	Total
37.1	11.3	3.2					4.8	8.1		14.5	93.5
							15.5		5.2	3.4	105.2
1.6		1.6					14.2	1.6	20.6	14.3	103.2
			3.3	3.3			23.3				99.9
10.5	5.8	13.9	10.5	3.5	9.3		8.1	7.0	7.0	8.1	172.3
4.3	3.5								2.6	20.2	166.4
					1.3		4.0			12.6	96.2
2.7	3.3		6.0	1.4	2.0	6.7	56.0	16.0	4.0	12.7	129.7
4.2		2.4	14.5	0.6	46.1	1.2	5.4	3.0	5.4	4.2	122.6
1.7	0.8	2.6	17.9	0.8		0.8	0.8	6.0	13.7	8.5	116.0
15.0			7.1		5.0			4.3	0.7	5.7	91.4
9.9	1.5	1.5	15.2	15.9		4.5	1.5				144.6
				1.4	4.2	4.2					94.3
	13.0	1.1	7.6		14.1						115.1
0.6	0.6		2.6		1.9	5.8					103.1

12	13	14	15	16	17	18	19	20	21	22	Total

Number of group members in all groups concerned with each task in the respective groups' task list .



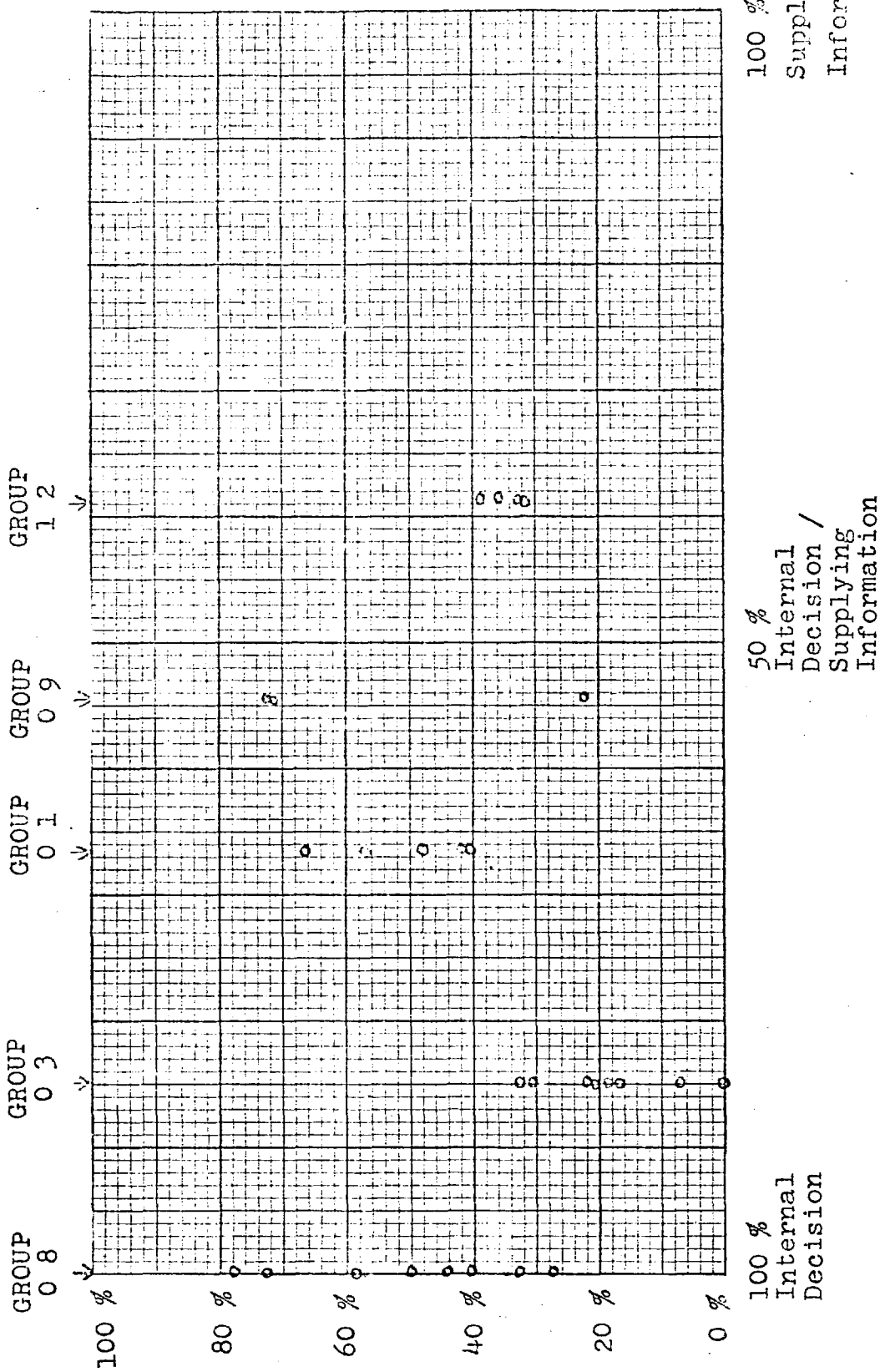


Regression (l.s.) of the frequency of recorded interaction of group members with other group members against the number of group tasks that member is associated with .

Relationship between contact outside the Group and the groups' control over task decision - making .

APPENDIX

14.23



The X ordinate places each of the five groups included in appendix 13.18 according to what percentage of total group tasks could be identfied as either internal decision or containing an element of supplying information . Y axis gives the frequency of contact external to the group for each group member .

	Manager	Superintendent	Senior Officer	Officer	Supervisor
0 1		9.2 57.1		14.3 40.3	6.0 41.3
				10.9 48.2	3.0 66.3
0 2		13.1 30.0		0 28.0	
0 3	15.3 21.0	46.6 33.3	1.0 0	14.4 20.6	
				11.1 19.1	
				0 17.7	
				0 32.2	
				10.6 7.4	
0 4	5.2 55.3		19.6 25.5		
			6.9 48.2		
0 5	49.4 47.0			15.3 27.4	
				43.6 23.1	
0 8	45.2 50.0			6.5 27.4	
				17.4 58.4	
				22.2 33.3	
				23.2 73.3	
				14.9 78.1	
				12.2 40.5	
				14.8 44.7	
0 9	11.1 71.7			11.5 72.7	
				10.0 22.1	
1 2			25.0 31.8	9.9 38.0	
				3.3 32.6	
				12.9 33.5	
Mean	25.2 49.0	23.0 40.1	17.2 35.2	12.7 27.2	4.5 53.8

Frequency of internal and external interaction of group members arranged according to Organisational Status .

l.h figure represents internal interaction
r.h figure represents external interaction

	1	2	3	4	5
0 1		9.2 57.1	14.3 40.3 10.9 48.2	3.0 66.3	6.0 41.3
0 2		13.1 30.0	0 28.0		
0 3	15.1 21.0	46.6 33.3	1.0 0	14.4 20.6 11.1 19.6 0 17.7 0 32.2 10.6 7.4	
0 4	5.2 55.3	19.6 25.5 6.9 48.2			
0 5		49.4 47.0	15.3 27.4 43.6 23.1		
0 8		45.2 50.0	6.5 27.4 17.4 58.4 22.2 33.3 23.2 73.3 14.9 78.1 12.2 40.5 14.8 44.7		
0 9	11.1 71.7	11.5 72.7 10.0 22.1			
1 2		25.0 31.8	9.9 38.0 3.3 32.6 12.9 33.5		
Means	10.5 49.3	23.7 41.8	13.9 39.2	6.5 27.3	

Frequency of internal and external interaction of group members arranged according to Group Status .

l.h figure represents internal interaction
r.h figure represents external interaction

Table of Wilcoxon / Mann-Whitney coefficients for the frequencies of <u>within</u> and <u>external</u> interactive contact in group and organisation classified roles .

<u>Organisation based</u>

Internal Contact	External Contact	Between Populations :
0.309	0.320	M / O
0.486	0.625	S So / O
0.413	0.463	M S So / O

<u>Group based</u>

Internal Contact	External Contact	Between Populations :
0.356	0.469	2 / 3
0.183	0.217	2 / 4
0.75	0.760	3 / 4
0.409	0.457	1 2 / 3
0.192	0.205	1 2 / 4

M S refer to Manager , Supervisor etc.
1 2 refer to level within the group

	Manager		Superintendent		Senior Officer		Officer		Supervisor	
0 1			28.6	37.8			25.4	38.4	34.3	9.1
							20.0	12.7	30.0	17.7
0 2			5.3	32.9			25.2	18.0		
0 3	76.3	28.1	45.4	21.6	15.3	1.0	22.5	15.0		
							33.0	27.9		
							39.2	19.6		
							26.4	5.6		
							21.7	6.8		
0 4	21.0	15.8			6.9	48.3	19.6	11.8		
0 5	31.6	13.9					29.9	2.6		
							18.8	18.9		
0 8	46.5	19.8					19.0	12.1		
							15.9	20.6		
							32.2	14.5		
							20.0	30.0		
							58.5	25.4		
							40.5	24.3		
							31.3	16.0		
0 9	10.0	10.0					24.8	5.5		
							24.7	35.9		
1 2					63.7	22.0	36.6	5.6		
							45.1	30.8		
							65.8	19.4		
Means	37.1	17.5	26.4	30.8	28.6	23.8	30.3	17.1	32.2	13.4

Frequencies of Clarifying Problem and Choosing Action categories for group members (arranged in Organisational Status .

l.h figure is clarifying problem
r.h figure is choosing action

1	2	3	4	5
	28.6 37.6	25.4 38.9	34.3 9.1	30.0 17.7
		20.0 12.7		
	5.3 32.9	25.2 18.0		
76.3 28.1	45.4 21.6	15.3 1.0	22.5 15.0	
			33.0 27.9	
			39.2 19.6	
			26.4 5.6	
			21.7 6.8	
21.0 15.8	6.8 48.3			
	19.6 11.8			
	31.6 13.9	29.9 2.6		
		18.8 18.9		
	46.5 19.8	32.2 14.5		
		19.0 12.1		
		15.9 20.6		
		20.0 30.0		
		58.8 25.4		
		40.5 24.3		
		31.3 16.0		
10.0 10.0	24.7 35.9			
	24.8 5.5			
	63.7 22.0	36.6 5.6		
		45.1 30.8		
		65.8 19.4		
35.8 18.0	29.7 24.9	31.3 18.2	25.9 14.0	

Frequencies of Clarifying Problem and Choosing Action categories for group members (arranged in Group Status .

l.h figure is clarifying problem
r.h figure is choosing action

APPENDIX 14.29

Table of Wilcoxon / Mann-Whitney coefficients for the frequencies of clarifying problem and choosing action categories for roles classified according to organisation, and group role .

Organisation based

Clarifying Problem	Choosing Action	Between Populations :
0.426	0.504	M / O
0.587	0.290	S So / O
0.514	0.387	M S So / O

Group based

Clarifying Problem	Choosing Action	Between Populations :
0.519	0.356	2 / 3
0.408	0.75	2 / 4
0.437	0.604	3 / 4
0.504	0.387	1 2 / 3
0.571	0.275	1 2 / 4

M S refer to Manager , Supervisor etc.
1 2 refer to level within the group

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