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AN EMPIRICAL INVESTIGATION OF THE
INTERACTION "MANAGER-TASK" USING A HUMAN
INFORMATION PROCESSING APPROACH

TWO VOLUMES

VOLUME: 1

FOUZI MOHAMED BEN-ALI

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AUGUST 1986

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THE UNIVERSITY OF ASTON IN BIRMINGHAM

FOUZI MOHAMED BEN-ALI

DOCTOR OF PHILOSOPHY

1986

SUMMARY

This study set out to investigate empirically the interaction "manager-task". Specifically it focused on trying to understand how managers handle the complexity implied by the tasks of their concern. In short its focus was in trying to isolate the various information management strategies used by managers when operating in their organisations.

A model was created to bring together many ideas from a number of authors, and which relied to a considerable extent on the work of a notable management cybernetician, Stafford Beer, and his conceptualisation of management i.e. management is the profession of regulation. The model highlighted the need to examine the manager's strategy to collect and validate information and the manager's approach in responding to this information. As a method to examine the manager himself a number of tools were used and/or developed. Carl Jung's theory of psychological types formed the basis of the method to examine the manager's cognitive style. Two anxiety/strain instruments were used as a way of gaining from the manager's point of view his "fit" within the organisation. Beer's Viable System Model formed the basis of the framework to analyse the organisation structure the manager was operating in.

It was found that Beer's conceptualisation of management and his Viable System Model provide a powerful conceptual framework to understand what managers do in the organisational context. There is evidence that managers' cognitive styles are an important variable in defining the strategies used by managers to handle complexity. It also appears that tasks are not independent of the manager but rather it is the manager himself who defines, shapes and develops the tasks.

KEY WORDS: MANAGER, VIABLE SYSTEM MODEL, COGNITIVE STYLE, STRAIN, ORGANISATION.
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To

My Late Father

If only you know how much I miss you.

and

Widad, Asma and Iman
CHAPTER ONE

INTRODUCTION TO THE STUDY

1.1 Background To The Study

How managers think and operate has become an increasingly researched area in the last three decades. This is partly due to the increasing influence that managerial decisions have on our day-to-day lives and our need to understand how these decisions are made, in the hope that we can somehow influence and shape those decisions. But probably the greatest motivation behind a great deal of the work carried out by management scholars stems from three main sources, these being:

1) A need to improve the knowledge base in particular areas of management.

2) The inadequacy of some existing management theories in explaining the nature of managerial work and in giving an accurate reflection of how managers operate, and should be operating, in organisations.

3) Recent advances in other disciplines have given new, relevant and important insights that have forced management researchers to rethink and reexamine both the classical and established theories of management.

The author's drive to understand how managers operate and interact, how they develop and shape their tasks, is borne from a combination of the three above-mentioned sources. That is, the inadequacy of existing management theories has led the author to look to new advances in other areas to help explain how managers operate (with the aim of improving the corpus of management
theory in an area where we have a poor understanding of the mechanisms underlying the interactions of the manager with the tasks of his concern).

1.2 The Research Problem

Using a human information processing approach and drawing on the disciplines and theories of organisational cybernetics and cognitive psychology the author attempts to:

1) Develop a different methodological approach to those currently used in the study of how managers operate, in the hope of overcoming some of the major weaknesses outlined by major reviewers of managerial work and research.

2) Empirically examine how managers operate, perceive, develop and shape their tasks in an attempt to highlight the strategies used by managers in handling their complexity.

When the author uses the term human information processing approach, the term has two connotations with respect to this study. First it means using recent advances in how the human brain processes information, and secondly, it means using the work of Stafford Beer on the general laws and principles which govern the control processes and organisation of the central nervous system.

The need to draw on the disciplines of cybernetics and cognitive psychology will become evident to the reader as the author begins to examine and review the literature in the area of how managers operate in organisations. However, cybernetics is unique in that 'it offers a method for the scientific treatment of the system in which complexity is outstanding and too important to be ignored' (Ashby, 1964). Cybernetics, defined by the American mathematician and founder of the science of cybernetics as the 'science of control and communication in the
animal and in the machine" (Wiener, 1961), is about finding invariances, or laying down invariances, that give a dimensionability to the system under study. Cybernetics isolates relevant dimensions that are common across a variety of systems. In this case the system under study is the manager-task interactions, as defined by the structure of how the individual manager operates, and the strategies that he uses to handle the complexities of his job. In terms of this study it sets the author the objective of seeking the kind of abstract variables that would give a dimensionability to the ways managers operate and permit the classification of individual managerial strategies in handling complexity, based on the assumptions that these dimensions recur.

Recently published papers in management and psychology journals stress the need for scholars and researchers in management to examine cognitive differences in managerial information processing. These differences stem from the way our cerebral hemispheres process information. It is widely believed by experts in the area of neuro-physiology and neuro-cybernetics, and to some extent clinically shown, that we as human beings become dominant in the way our cerebral hemispheres process environmental information. As the brain matures specific hemispheres become specialised in particular types of information processing and individuals become dominant with respect to the type of information processing they use to process and handle environmental information. If this is so, it could partially explain widely perceived differences in managerial behaviour and differences in managerial operating modes, for managerial tasks imply both a certain degree of complexity and of content which, to be adequately managed, require a cognitive ability on the part of the manager that can handle or absorb the complexity of the task.

The author in this study seeks to empirically examine and test the following hypothesis:
"Managers, consciously or unconsciously, use certain strategies to handle the complexity of their tasks. Two major variables underlying the explanation of these strategies are the manager's cognitive style and the structure of the system the manager operates in."

By cognitive style is meant:

"Stable individual preferences in mode of perceptual organisation and conceptual organisation of the external environment." (Kagan et al, 1963: 2)

1.3 The Methodological Approach To Be Used In The Study

The methodological approach to be used in this study differs considerably from most methodological approaches used in the studies of how managers operate. It involves a rigorous understanding and formulation of a model to be used in the study of how managers operate prior to carrying out any empirical work. Most of the findings in management studies are based on empirical generalizations. That is, researchers rely to a considerable extent on their findings to model the situations of their concern. The approach taken here differs from the main stream of methodological approaches in that it attempts to formulate an understanding of how managers operate, sets up a model a priori, and attempts to empirically validate it. This approach was guided by the early work of Stafford Beer into the nature of a scientific model (Beer, 1966). While the author's approach does not follow Beer's well defined and necessary steps to the letter, it does, however, use his work as an important and valuable guide. Stafford Beer's ideas into the nature of scientific models and his contributions to cybernetic theory, in particular organisational cybernetics, have given management scholars a far more meaningful perspective into understanding the complexity of both the organisational system and the managerial process.

The methodological approach to be used in this study is very much multi-disciplinary, which requires a number of rigorous and well defined steps to be followed sequentially in order to test the general hypothesis. This approach is
shown in diagrammatical form in Fig. 1.1. The first step required by the method is for the researcher to carry out a literature review of major studies in the area of how managers operate. This is to establish the existing knowledge base at the time of the study. It specifically requires the researcher to highlight major findings by management researchers in the area under study. This in turn highlights major weaknesses and information gaps that the researcher must be conscious of when carrying out his study, and which he must endeavour to overcome if at all possible. This in turn leads to step two which requires the researcher to examine other disciplines for possible methods in order to overcome some of the shortcomings and weaknesses which he has recognised by carrying out the first part of the literature review. With respect to this study it entails a literature review in the area of cybernetics and in particular organisational cybernetics. Once the researcher has gained a richer understanding of the managerial process and the working mechanisms underlying organisations he creates a model, step three, by putting down his thoughts and perceptions of how he perceives managers as operating in their organisations. It must be understood that models are more than analogies: they are meant to disclose the key structure of the system under study (Beer, 1975). This model is to some extent a loose understanding that can only be improved on, modified, validated or invalidated by carrying out studies on managers presently working in organisations. This loose understanding triggers a need to validate the model empirically. However this can only be done by a rigorous formulation of the ideas and perceptions, step four, and by creation of sub-models and specific tools that break down the model to enable its testing. The author uses many of the ideas of Raul Espejo in the area of developing tools to capture and analyse the complexity of organisations, especially with respect to the application of Stafford Beer's Viable System Model. These tools are then used in a field study, step five, and are applied to a number of managers in differing organisations to either validate or invalidate the model.
THE METHODOLOGICAL APPROACH

STEP ONE
LITERATURE REVIEW
MAJOR STUDIES PREVIOUSLY
CARRIED OUT THAT SEEK TO
EXPLAIN HOW MANAGERS OPERATE

establishes

EXISTING KNOWLEDGE BASE
AT THE TIME OF THE STUDY

highlights

MAJOR WEAKNESSES AND
INFORMATION GAPS THAT NEED
TO BE OVERCOME

leads-to

STEP TWO
EXAMINATION OF RELEVANT
ADVANCES IN OTHER DISCIPLINES.
CYBERNETIC INSIGHTS

giving

IMPORTANT INSIGHTS INTO
UNDERSTANDING HOW MANAGERS
OPERATE WITHIN THEIR
ORGANISATIONAL SYSTEM

produces

STEP THREE
AUTHOR'S PERCEPTION AND MODEL
OF HOW MANAGERS OPERATE

triggers

A NEED TO EMPIRICALLY VALIDATE
THE AUTHOR'S MODEL

by-means-of

STEP FOUR
RIGOROUS FORMULATION OF IDEAS
AND PERCEPTIONS IN THE FORM OF
SUB MODELS

which produces

SCIENTIFIC TOOLS TO BE USED BY
THE AUTHOR TO CAPTURE
MANAGERIAL DATA AND NECESSARY
ORGANISATIONAL DATA

applied-in-a

STEP FIVE
FIELD STUDY
A NUMBER OF COMMERCIAL
ORGANISATIONS

produces

EMPIRICAL RESULTS

that validate
or invalidates or modifies

Fig. 1.1
The researcher can then use this information to modify his model or, having recognised weaknesses in some of the scientific tools used, attempt to modify them or highlight their weaknesses to future researchers.

1.4 Plan Of The Study

The plan of this study is based on the methodological approach described previously. In chapter two the author reviews major studies on how managers operate drawing on papers using either of two major approaches, viz. the managerial behavioral approach and the human information processing approach. Major weaknesses and information gaps are highlighted. This leads to the second part of the chapter where the literature in cybernetics and systems science is examined to gain important insights that may shed light on ways to study how managers operate. In chapter three the author presents his understanding and ideas in a form of a model that attempts to disclose the key structure of how managers operate and the strategies they use. This model poses a number of specific hypotheses that need to be empirically tested. In chapter four the various methods used to test empirically the specific hypothesis are outlined and specific tools in the form of questionnaires and sub-models are developed to test the model. In chapter five an explanation of how the author carried out the field study, outlining the sample and method of data collection is explained. In chapter six empirical results are discussed with reference to the model. In chapter seven major conclusions of the study are outlined leading to chapter eight where specific recommendations are made to future scholars wishing to undertake similar research.
CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

It is the purpose of this chapter to review major studies carried out by researchers in trying to explain how managers operate in their working environments. While it is recognised that there exists a number of methodological approaches and theories, used by researchers, it is not the purpose of this study to review all of them but rather to concentrate on a number of them to highlight the nature of the findings attained by such approaches. The author first reviews a number of major empirical studies that have already been carried out on managers and then follows this by a review of some of the findings attained by the human information processing approach. Once this is done, the author then reflects on the findings and highlights major weaknesses that appear to emerge from such studies. In an attempt to overcome some of these weaknesses, the author then reviews the literature in the area of systems science and cybernetics. The purpose of this is to see if recent advances in these disciplines can somehow seek to explain how managers operate, or provide the author with a framework by which managerial operating modes and strategies can be examined in a consistent and effective manner.

Major Empirical Studies On How Managers Operate

In a recent paper Rosemary Stewart summarises how recent empirical findings have changed the traditional perception we have of the way managers behave:
"From viewing managerial behaviour as primarily:

Orderly
to disjointed, characterised by
'\textit{Brevity, variety and fragmentation}'

Planned
to reactive and instinctive

Working with subordinates
to recognising importance of
and boss lateral relationships

Using formal information
to also using informal,
speculative information"

(Stewart, 1983: 96)

This conclusion is probably based on her understanding of the major findings reached by her own empirical studies and those of Mintzberg (1973) and Kotter (1982).

Rosemary Stewart’s original study of managers and their jobs (Stewart, 1967) concentrated on finding similarities and differences in the way managers spend their time. In this study 160 managers kept diaries of their activities for four weeks. She found that managers in her samples spent 41% of their contact time with employees, 12% with their own bosses and 47% with people outside the organisational chain of command.

Mintzberg’s study on the nature of managerial work (Mintzberg, 1973) was based on an observational study of five chief executives, each for a period of one week. From the results of the observational study he points to three major set of roles that managers carry out:

1st set of roles: three interpersonal roles:
   a) figurehead    b) leader    c) liaison

2nd set of roles: three informational roles:
   d) monitor       e) disseminator  f) spokesman

3rd set of roles: four decisional roles:
   g) entrepreneur   h) disturbance handler
   i) resource allocator  j) negotiator
In a later paper he reflects on these results and states:

"Do all managers play all the ten roles? We think we have shown that they do, that these ten roles describe the work of managers from foremen to presidents, from managers in corporations to those in school systems and governments. But saying that all managers play all ten roles is not to say that every manager gives equal attention to each role" (Mintzberg, 1978: 263).

In a more recent empirical study, Kotter studied 15 general managers from a diverse set of corporate settings using interviews, observation and questionnaires. He isolates two invariances in the way general managers approach their work and what they do each day i.e. agenda setting and network building. He also recognises two relevant elements with respect to the manager's job demands, these being:

1) Keeping on top of a very large and diverse set of activities. Being able to identify problems ("fires") that are out of control and solve them quickly.
2) Getting corporate staff, other relevant departments or divisions, and important external groups to cooperate despite the lack of any formal authority over them" (Kotter, 1982: 14-17).

What clearly emerges from these three studies are three major points. The first is that there appears to be a lack of consistency between the purposes of the studies and the actual variables chosen to carry out the study. The objective of the studies implied that they were going to draw invariances in the nature of managerial jobs and the way managers operate - Invariances that would allow anyone to recognise what managers do and how they operate irrespective of the nature of the industry or the organisational setting. Their results do not appear to achieve this. The level of abstraction they chose to operate at ignored important dimensions of the system they were studying. The purpose of the study necessitated that they be systemic in their approach, incorporating all relevant dimensions that affect the managerial system. Such an approach would have clearly recognised the importance of the organisational variable in such studies. This point can best be highlighted in the approach taken by Mintzberg, who states:
"If you ask a manager what he does, he will most likely tell you that he plans, organises, coordinates, and controls. Then watch what he does. Don't be surprised if you can't relate what you see to these four words (Mintzberg, 1975: 49).

Such a case assumes that managerial behaviour is observable and gives no appreciation to the organisational context in which such behaviour occurs.

The second point is that, the models used by these studies are not dependent on a clearly stated conceptualisation of management. These studies are dependent on their findings to help them formulate a conceptualisation of management. The problem that emerges from this is that any change in the organisational setting necessitates a change in the initial model, leaving the model in a continuous state of instability.

The third point that emerges from these studies is the perception that the manager's task is independent of the manager himself. It is not only these three researchers that give this impression but many others also. Managerial tasks have been differentiated by their level of hierarchy in the organisation, e.g. top level task, middle level task etc and so on. Recently some authors have began to look at tasks based on their analysability (Daft et al, 1981), their variability (Perrow, 1967; Hickson et al, 1969; Woodward, 1965; Litwak, 1961; Hage et al, 1969; Delbecq et al, 1969 and Grimes et al, 1970). Others have looked at tasks in terms of difficulty (Perrow, 1967; March et al, 1958; Hage et al, 1967 and Van de Ven, 1973). Such treatment ignores research findings in the field of psychology that stress that individuals cognitively organise the world around them and that each individual perceives the environment around him in his own particular way.

2.3 Human Information Processing

Literature in the area of human information processing is quite extensive, especially in the fields of psychology and neuropsychology. However management
researchers have only recently focused on this area. There seem to be three basic approaches that management researchers have used in studying human information processing (HIP):

"One approach attempts to model the heuristics that individuals use in making choices.... The ultimate aims of this approach are two. The first is simply to build a descriptive model of how people process information, particularly in complex situations. Second, the applied purposes is to provide decision makers with "good" or "efficient" models so that their decisions can improve.

A second approach to HIP deals with cognitive complexity, the relative complexity within an individual's conceptual system. An optimal level of environmental complexity is identified, suggesting that too little or too much environmental complexity results in reduced ability to process information....

A third approach, that has found more recent acceptance within management, emphasizes the dual nature of HIP. It expressly identifies HIP styles that are qualitatively different (based on the cerebral hemispheres in the brain)" (Taggart et al, 1981: 187-188).

While the approaches are different, each accepts the fact that there exists a fundamental information processing model. One that has gained some form of recognition in the literature is the Atkinson-Shiffrin Information Processing Model outlined below:

(Atkinson et al, 1971: 82)
However even this model is widely criticized for:

"1. Its emphasis on role rehearsal as the major process for registering information in LTS.
2. Its suggestions that items in STS are automatically accompanied by their meaning.
3. Its claim that STS is essential for input and retrieval from LTS.
4. Its implication that STS is a unitary system" (Baddeley, 1976: 155)

Simon, in describing man as an information processor, examined the development of such a processor. In so doing he emphasized that we should give greater emphasis in our research to the limitations of capacity in short-term memory, the mechanisms of attention, the long-term memory capacity, the hemispheric specialization in long-term memory, and the control of behaviour (Simon, 1972). Miller had previously examined the limitations of channel capacity and concluded that:

"If input in bits per second is plotted on the abscissa against output in the same units on the ordinate, output will rise as a linear function of input up to a certain point, levelling out at channel capacity which cannot be exceeded, remaining at that level for a period. It will probably then decrease swiftly, the amount of information being put out actually decreasing in a "confusional state" as the input rate continues to increase. This represents a final collapse of this function of the system" (Miller, 1960: 697).

Others have examined this "overload" from the viewpoint of decision-making:

"It appears that increasing environmental complexity and load has the effect of first increasing the degree of flexibility of integration involved in decision making to an optimal peak, then causing it to diminish as "overload" occurs" (Schroeder et al, 1967: 61).

Miller made great headway in this area by examining what happens to the human processor once "overload" does occur, and the mechanisms of adjustment that the processor incorporates. These mechanisms are identified as:

"(a) Omission-temporary nonprocessing of information.
(b) Error-processing incorrect information.
(c) Queuing-delaying the response during a period of high overlap of input information.
(d) Filtering-neglecting to process certain categories of information while processing others.
(e) Cutting categories of discrimination."
Employing multiple channels-processing information through two or more parallel channels at the same time. 

Escape from the task" (Miller, 1960: 697).

The basic information-processing model and the basic concepts that go with the model form the basis of information-processing theory, and have had a considerable amount of influence in what we often term as "individual decision-making". However there is considerable emphasis in the current literature that emphasizes that these applications have omitted a crucial aspect of the process. This aspect is the cognitive style used by the individual in the processing of the information (Ungson et al, 1981). The cognitive "style" of an individual is defined as:

"Stable individual preferences in mode of perceptual organization and conceptual organization of the external environment" (Kagan et al, 1963: 2).

Hunt goes as far as to suggest that there exists "biological cognitive motivations in human information processing" (Hunt, 1963). "The motivation to seek a certain optimal amount of complexity in one's environment is suggested as one such cognitive motivation" (Driver et al, 1969). Huysman showed that cognitive style is an effective constraint for the enactment of operational research study proposals (Huysman, 1970), and Doktor et al (1973) went further in suggesting that cognitive style might act as an obstacle for the acceptance of management science recommendations. "Statistical evidence favourably supports the existence of individual differences in information perception and information selection" (San Miguel, 1976). Although not all researchers believe this to be so. For example:

"The study of cognitive style as a basis for deriving operational guidelines for MIS and DSS designs has not been fruitful and such study is likely not to prove fruitful" (Huber, 1983: 570).

Redding examined cognitive style from a cultural perspective and noted that:

"Western cognition: Logical, sequential connections. Use of abstract notions of reality which represent universals. Emphasis on cause.

Dermer studying the perceived importance of information in accounting studies found:

"The results of this study indicate that accounting studies examining the effects that alternative types of information provisions have on decision-making behaviour can be influenced by the cognitive characteristics of the participants.... One of the strongest relationships found in this study was the negative correlation between ambiguity, tolerance and the amount of information perceived to be important" (Dermer, 1973: 516 and 518).

Probably the greatest in-depth studies of cognitive style have come from the field of psychology. Adorno et al's study of authoritarianism "revealed that authoritarian subjects to be more intolerant of ambiguity and more rigid than nonauthoritarian subjects". Rokeach's study of dogmatism perceives that "a person can be best understood by studying his beliefs and disbeliefs" and that an individual's cognitive processes are probably organized or structured on the basis of belief and disbelief systems. Kelly's study of personal constructs and cognitive complexity is based on the premise that an "individual's present constructs are subject to revisions or replacement". He argued that man is actively engaged in cognitively organising the world that is around him, with the essence of man's activity being his forecasting of events (Goldstein et al, 1978). Witkin et al's study of field dependence found that "the more differentiated the individual, the more field independent he is. Differentiation may be understood as the capacity to distinguish graduations of a stimulus dimension" (Goldstein et al, 1978).

Management researchers in the last decade have focused on the cognitive style aspect of HIP and have come up with some interesting results. At times the term "decision style" has been used to describe the cognitive style used in the decision-making process of managers. In an attempt to focus on the characteristics of managerial cognitive processes, management researchers have used a "typology" strategy. These strategies are numerous and differ from author to author. For example, Sieber et al based their studies on the difference between individuals who prefer to think in abstract or concrete terms:
(a) Information search and time spent in processing information are curvilinearly related to uncertainty and to external demand.

(b) Abstract persons search for more information and spend more time in processing information than do concrete persons.

(c) Information search and information processing by abstract persons increases more with increasing uncertainty than does processing by concrete persons.

(d) The asymptote of searching and processing time occurs at a lower level of uncertainty and external demand for concrete persons.

(e) Searching and information-processing time of abstract and concrete persons are most dissimilar in the middle ranges of uncertainty and external demand.

(f) Abstract persons give more information in their decisions than do concrete persons.

(g) Abstract persons are more likely than concrete persons to qualify their decisions with remarks indicating remaining doubt, uncertainty, and tentativeness" (Sieber et al, 1964: 114).

A common typology found in management research is the use of Carl Jung's psychological types. Carl Jung had stated that what appears to be random variation in human behaviour is actually quite orderly and consistent, being mainly due to dispositions towards one psychological orientation over another. What Carl Jung (1923) had observed is that what emerges for each individual is a dominance of orientation for each of four major dimensions, which he refers to as extroversion-introversion, sensation-intuition, thinking-feeling and judgement-perception. What has been of considerable debate in the literature is which combination of these orientations or dimensions characterise the individual's style of information processing. Mason et al treat each orientation on two dimensions (sensation-intuition and thinking-feeling) as being a unique style of information processing, here briefly summarised:

**Sensation Type:** Objective hard facts and attention to detail. Data bound. Afraid to risk generalization. Information entirely empirical devoid of almost any theoretical context. Day-to-day operations management.
Intuitive Type: Objects as possibilities and in totality, as a Gestalt. Data free. Strength of strategy making. Information will be in the form of imaginative stories, "sketches of future possibilities.

Thinking Type: Relies primarily on cognitive processes. Evaluations along abstract True/False judgements, and are based on formal systems of reasoning. Rule making, especially formal rule-making. Instinct to formulate models. Information will be entirely symbolic (model, string of symbols).

Feeling Type: Relies primarily on affective processes. His evaluations tend to run along personalistic lines of good/bad, like/dislike. Takes moral stands. Information takes the form of "art", "poetry", "human drama" and especially "stories that emphasize or have a strong moral content".


However not all authors agree. Taggart et al stress that characterization of style is dependent on the combined orientations of two dimensions (thinking-feeling and sensation-intuition). They came up with two major cognitive styles using a Jungian typology and at the same time related them to the cerebral asymmetry in the human brain: (Taggart et al, 1981)

"Sensation-Thinking Type
Left hemisphere processing. Logical, sequential, objective, causal, deductive, and analytic.

Intuitive-Feeling Type
Right hemisphere processing. Non-logical, simultaneous, subjective, acausal, inductive, and synthetic."


Using the same typology Henderson et al compared the types with the ability to handle risk:

"Cognitive style was found to be an important factor in the decision to adopt and the assessment of risk. ST (Sensation-Thinking) styles saw the highest risk and were reluctant to adopt the projects, while SF (Sensation-Feeling) styles were risk tolerant and more likely to adopt the same projects" (Henderson et al, 1980: 371).
Davis also concluded that "sensing-feeling and sensing-thinking types are better
decision makers than intuitive-thinking types at the operational level" (Davis,
1982). Blaylock and Winkofsky found that cognitive style is directly related to
innovation in R & D processes (Blaylock et al, 1983). Some authors have come up
with cognitive style positioning theories to reduce conflict and increase the
effectiveness of the organisation by matching the cognitive style of the individual

New developments in cognitive style or decision-style literature have
attempted to establish a link between the cognitive style of the individual and the
cerebral hemispheres of the brain. The reasoning behind this is related to the fact
that while cognitive style theory has been useful in identifying the various modes
of processing, it still does not explain the reason why this grouping occurs. Since
the 1950s, and as a partial result of the split-brain studies of Sperry and his
colleagues, neuropsychologists and neurophysiologists have increasingly studied
patients before and after a commisurotomy operation (bisectioning the corpus
collosum that links the two hemispheres and thus isolating each half of the brain)
and found evidence of two major modes of processing existing in the brain. It is
generally believed that the left-hemisphere of the brain uses sequential processing
and the right simultaneous processing. Literature in this area is quite extensive
from a neuropsychological perspective, however several articles are of particular
interest. Of particular importance is the recognition of the complexity of the
human brain:

"A typical neuron in the cortex of brain may make over ten thousand
connections with other cells, and the total number of synapses in the
brain is probably in the order of ten trillion at least 10,000,000,000,000. The mind boggles at its own complexity.

There is little hope that we can analyze all the interconnections in a
single brain. Research workers at Cambridge University have spent
three years analyzing the nervous system of a very simple worm. This
creature has only twenty-three neurons yet it took a team of scientists
and a computing system three years just to analyze the
interconnections of these few neurons" (Russel, 1979: 33-34).
However, given the limitations imposed by the complexity of the human brain some interesting results have emerged:

"Taken together, our studies seem to demonstrate conclusively that in a split-brain situation we are dealing with two brains, each separately capable of mental functions of a high order. This implies that the two brains should have twice as large a span of attention - that is, should be able to handle twice as much information, as a normal whole brain" (Gazzaniga, 1973: 98).

"Several studies were conducted which provided evidence that the left hemisphere is superior for the processing of sequential stimuli and for the organization and performance of sequential motor-responses. In addition, two components of a sequential task were defined, timing and ordering, and shown to be important in determining the left hemisphere superiority. Where the tasks could be performed better by a gestalt form of processing a right hemisphere superiority was obtained" (Layton, 1978: 1 - summary).

Some of the studies have led Mintzberg to hypothesize that:

"the important policy processes of managing an organization rely to a considerable extent on the faculties identified with the brain's right hemisphere. Effective managers seem to revel in ambiguity; in complex, mysterious systems with relatively little order" (Mintzberg, 1976: 53).

Doktor et al, using EEG (a recording of faint electrical signals on the scalp which result from the electrical activity of the brain), examined this by testing executives and operations researchers, and their results confirmed their hypothesis although their sample was statistically small:

"For the operations researchers, language and analytical tasks were expected to engage primarily the left hemisphere, spatial and intuitive task were expected primarily in the right hemisphere, consistent with earlier findings with normal subjects (the presidents were expected to engage primarily the right hemisphere independent of cognitive task)" (Doktor et al, 1977: 385).

Different methods of processing information and different groupings of individuals could well explain Grayson's observations that:

"Managers and management scientists are operating at two separate cultures, each with its own goals, languages, and methods. Effective cooperation - and even communication - between the two is just about minimal" (Grayson, 1973: 41).

A fact that could also be answered by Triandis. "The greater the attribute similarity between A and B the greater the communication effectiveness between
them" (Triandis, 1960). Cognitive style is not the only major variable believed to affect the information-processing process of managers. Moskowitz et al recently examined the attributes of the incoming message to the system and believe the following message attributes to have an effect on the information processing behaviour of the processor.

1. informativeness
2. order effects
3. sequential versus simultaneous presentation
4. favorability
5. objective versus subjective sources
6. source complexity

Another variable that seems to explain a significant portion of the information processing behaviour of the manager is the task environment in which he operates, as shown by McGhee et al:

"The results of this experiment provided little support for the notion that personality variables explain a significant portion of the variance in human information processing behaviour.... On closer examination, both personality theorists and cognitive psychologists argue that to explain a significant portion of the variance in behaviour, a model should account for the processor, the task and the task processor interaction. And of these two main variables, the person variable may be the least important" (McGhee et al, 1978: 692-693).

But are manager's perceptions of their task environment stable? Griffin's (1981) results show that "employee's perceptions of their tasks are fairly stable, at least over short time periods". Tushman et al (1978) also found that "the tasks of organizational subunits vary in their degree of uncertainty". Uncertainty being here defined as the difference between the information being processed and the information required to complete the task.

"P2: As work related uncertainty increases, so does the need for increased amounts of information, and thus the need for increased information processing capacity.... In short, the greater the uncertainty faced by the subunit, the greater are its information processing requirements....

P3: different organization structures have different capacities for effective information processing...."
P4: organizations will be more effective when there is a match between information processing requirements facing the organization and the information processing capacity of the organization's structure.

P5: if organizations (or subunits) face different conditions over time, more effective units will adapt their structures to meet the changed information processing requirements" (Tushman et al, 1978: 616-621).

Cravens compared decision-maker, task, and interaction variables (independent set) with information-processing variables (search, evaluation, and integration phases) and found a high correlation. Of the independent variables he found that information processing efficiency (the efficiency of an individual in assimilating information), task result (degree to which positive statements can be made regarding a task solution), Image state (accumulated, organised knowledge of the individual concerning a particular task) and risk-taking (tendency toward risk-taking in problem solving situations) to be the key contributors to the independent set. He states:

"These results suggest the following description of an individual's task-oriented information processing behaviour: those individual's who process information relatively inefficiently, have relatively low states of knowledge concerning a task at its outset, tend to be risk takers - on tasks where the results are rated relatively high, tend to seek information from many sources, place high ratings on the competency and reliability of rejected information elements, spend more time in evaluating information, and place low relevance ratings on the information elements which they accept" (Cravens, 1970: B664).

2.4 Major Weaknesses And Information Gaps

The review of the management literature on how managers operate and/or process information have highlighted some of the methods and approaches management researchers working in this area have used, while at the same time showing some of the results that have been attained. While these studies on the information processing behaviour of managers have to some extent shed light on some aspects of the manager-task interaction, again there appears to be a lack of
consistency between the purposes of these studies and the actual variables chosen to carry out the study. At the surface level this is attributed to the use of models that neglect to incorporate key and relevant dimensions of the system under study. However the author feels the heart of the problem lies in the choice of the abstract level the researcher chooses to work at.

While it is clearly understood that a researcher has to concentrate on a limited number of variables, it is important however to recognise that whatever the set of variables that are chosen they should be ones that matter and that seek to represent the major dimensions of the system under study, at a particular level. The problem for the researcher is in determining which variables matter and where to set the boundaries of the system (note: the boundary of the system is in itself a property of the system). Everyone has different beliefs as to how a particular system operates, and thus the detection of any system is very much subjective. The final outcome in the choice of the variables and in the formulation of the model represents how the particular researcher perceives the system.

Now, there is no wrong model, but rather some models are better able than others in predicting the behaviour of the system being modelled. Whether the model is an implicit or explicit one, the researcher has little chance of predicting the behaviour of particular aspects of the system if that particular area of the system is not represented in his initial model. Thus important dimensions of a system can go unrecognised for a long period of time, until the researcher modifies his model or another researcher points to relevant relationships which others have not recognised or failed to incorporate in their models. The focus of the individual researcher has thus to be on trying to isolate the key dimensions of the system. His ability to achieve this depends on many factors.

The relevance of the dimensions only becomes apparent when they are used to describe or predict the behaviour of the system in question. Relevant
dimensions will give a rich understanding of the system. In reflecting on previous research on managers it does not seem evident that the results give us such a rich understanding. Now these researchers might say 'you are making a value judgement'. Maybe so, but the value judgement is built on insights that stem from a science that has put forward a number of powerful models and techniques that aid the researcher to isolate relevant dimensions.

This science is that of cybernetics, which does not rely on the findings emerging from an investigation to create and shape the implicit model (such models are not stable, because they are dependent on a particular environment i.e. the setting of the study, and any change in the environment necessitates a change in the initial model), that is systemic in its perception, and which requires the researcher to set out the key structure a priori to the investigation. The cybernetic approach is also a practicable one because it begins by formulating a model that uses invariances to reduce the variety of the system in question to a manageable one (Beer, 1966). At the same time it forces the researcher to work at a particular abstract level that enables him to isolate invariances, and thus it is less prone to ignore particular areas of the manager's system as do some approaches i.e. those models that treat managers as islands to themselves, while ignoring that managers are individuals working and operating in an organisational system that affects the very operations and information that they are handling (such models thus assume, whether consciously or unconsciously, that the environmental variables are stable). What cybernetics does require of the researcher is rigorous modelling that force him to represent the pattern of events in advance. How effective the model is depends on its ability to predict and represent the behaviour of the system in question.

The strategy used by the researchers of the three major empirical studies (Stewart, Mitzberg and Kotter) and those that used the human information
processing approach, seems to be a reductionist one. Too narrow a focus has led important dimensions of the system to be neglected. Many of the researchers using the human information processing approach sought to explain the information processing behaviour of managers without taking into account the organisational system, of which the manager was an integral part, and the way the manager perceives his task. The focus was rather on the individual, giving us results that tell us little of the human information processing behaviour of managers in organisations. The reason why such results were not achieved could best be understood in Beer's words when he reflected on the reductionist approach:

"Take a railway engine apart: there is no speed in there. Chop up the human brain, and you will not find a component called compassion (Beer, 1986: 2-3).

It is the author's perception that a way of overcoming the weaknesses (and inevitably the large information gaps that emerge from them) is to recognise three major elements when carrying out any research on the managerial process. The first is to establish a conceptualisation of management that actually reflects the purpose of having managers in an organisation. The second is to establish a framework that is systemic by nature, that seeks to disclose the key structure of the system under study, and one that is built on a strong theoretical paradigm. The third is to establish the abstract level that one will operate at and that is congruent with the initial purpose of the study. It is from this basis that the author examines the field of cybernetics, a science whose findings in the last thirty-eight years have been insightful and which could well be explaining many of the mechanisms that management researchers have been struggling to understand.

2.5 Cybernetic Insights And Systems Theory

The systems concept deals with those parts or elements that interact in a manner that an observer could possibly define them as a whole, with the
'wholeness' being perceived to emerge from the interaction and relationships between the parts. It thus has a central role in the study when we deal with human, organisational and environmental systems. Cybernetics, the science and control and communication in the animal and in the machine (Wiener, 1961), offers the researcher a method to understand not only systems behaviour but also viable systems. By viable it is meant the ability to maintain a separate identity, an aim that complex systems such as human beings, animals, organisations, social groups and so on, strive for in their environment. What is common to all these systems, is that they are all interacting with an environment that is far more complex than themselves. However, no matter what the degree of environmental complexity, every viable system's objective is to maintain its unity. Systems will continue to survive, according to the Law of Negative Entropy, as long as they continue to:

"Import from the environment more energy than they expend in the process of transformation and exportation" (Katz et al, 1966: 28-29).

The mechanism that the system uses to insure its continuous survival has been called "Autopoiesis" which has been defined as:

"A network of processes of production, transformation and destruction of components that produces the components which: i) through their interactions and transformations regenerate and realise the network of processes (relations) that produce them; and ii) constitute it as a concrete unity in the space in which they exist by specifying the topological domain of its realisation as such a network" (Maturana et al, 1975: 4).

This implies that what is kept within physiological limits of the homeostat is the organisation of the system. The organisation itself is defined as:

"The relations that define a system as a unity, and determine the dynamics of interaction and transformations which it may undergo as such a unit constitute the organisation of the system" (Maturana et al, 1975: 105).

What has emerged from cybernetic studies is that (1) the control and communication elements of the organisation that the system adopts, is independent of both the nature and content of its parts, and (2) that there are basic principles of control that apply to all large systems. These are based on
fundamental laws that have been traced in various systems and that have universal applicability. For example, one of the principles of control is that the controller is part of the system under control, that this function is spread throughout the whole architecture of the system, and it is control that facilitates both the existence and the operation of systems (Beer, 1981). What has also been recognised is that systems are held together by the communication between the parts.

2.5.1 The Relationship Between The Organisational System And Its Environment

The viability of the organisational system is largely dependent on its capacity to respond to challenges arising from the environment, and the complexity of the response should match the environmental complexity. For according to the Law of Requisite Variety "only variety can destroy variety" (Ashby, 1964); variety being defined as the number of possible states of a system. However given the idea that all systems are operating in environments that are far more complex than they are, and therefore these environments generate a great deal more variety; it thus leads the organisation to three possible states by which it can attempt to match the situational variety:

(1) Attempt to amplify its own variety, or
(2) Attempt to attenuate the situational variety or
(3) Use any appropriate combination of amplifiers and attenuators.

Since organisational systems are only perceived and defined by our own mental constructs, it thus falls to the responsibility of management to determine "information processing strategies" needed to cope with the environmental complexity.
2.5.2 Management And The Environment

One strategy that managers have used to cope with situational variety has been to structure the organisation in such a way as to both attenuate and amplify situation variety (Espejo, 1981). However not all of these amplifiers have been successful when we examine the number of business failures and the inability of many organisations to cope with the environmental complexity. This is why cyberneticians, most notably Stafford Beer, turned to the study of self-regulating systems, for they recognised that while management is accountable for everything that happens within the organisation "it cannot assume direct autocratic control of everything that happens" (Beer, 1975). What Beer came up with, following some thirty years research into the mechanisms of control in the central nervous system and other systems, was that if a system is aiming for viability it needs to develop five basic functions, Beer calls them system one, two, three, four and five, that actualise the control capacity internal to the system (Beer, 1979 & 1981). These five systems are shown in Fig 2.1.

The author will not go into the details of each of the functions and the organisational laws which they are subject to, as these are well formulated and explained in Brain of The Firm and Heart Of Enterprise (Beer, 1979 & 1981). However what we must recognise here is that Beer's Viable System Model offers a powerful tool by which we can assess the effectiveness of the organisation in dealing with its environmental complexity; and a much needed alternative approach to the way we design our business organisations.

A second strategy used by management to cope with the environmental complexity is by investment in information systems, and more recently computerised data processing systems have attempted to facilitate this process.
NAME OF THE VIABLE SYSTEM IN FOCUS.

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Fig 2.1
The basis on which management adopts such a strategy is linked to its belief that such a vertical information system will increase its capacity to process more information and also its use as a means to filter situational variety.

"This strategy increases the capacity of existing channels of communication, creates new channels, and introduces new decision mechanisms. It also increases the capacity of the organisation to make use of information acquired during task execution ... there are fewer exceptions referred up the hierarchy" (Galbraith, 1973: 30).

While such a strategy has been used successfully in many organisations, it continues to fall short of providing the necessary information for management. Too often, in many organisations, information systems have evolved into nothing more than sophisticated accounting systems, providing little in terms of relevant information necessary for the management of tasks. This is because many designers of these information systems lack the cybernetic insights into the filtering process that occurs in the organisation system. Successful systems have been applied as in the case of the use of "Cyber-filters" (Beer, 1975) and others applying the new microcomputer technology show good potential (Espejo, 1979). However recent research provides evidence that many information systems fail in the application by not recognising the user's cognitive style.

2.5.3 Management In Cybernetic Terms

Given these cybernetic insights the next question that must be answered is what does this concept of variety engineering have to do with management and the role of a manager in an organisation? To answer this, let me quickly turn to the traditional conceptualisation of management. John Child (1977) distinguishes three different conceptualisations prevalent in existing management literature:

1) Management as an economic resource that performs a technical and an administrative function.
2) Management as the professional corps that is identified by its expertise and credentials.

3) The political aspect of Management where management is seen as a system of power and authority.

Management in cybernetic terms is seen as "the task of making organisations effective" (Espejo, 1983), and cybernetics not only seeks to examine how managers operate, but also examines if the manager is using efficiently his capabilities for complexity management by reference to cybernetic laws. As Stafford Beer notes:

"Management is the profession of regulation, and therefore of effective organisation, of which cybernetics is the science" (Beer, 1985: x).

This conceptualisation clearly sets a purpose to the manager in an organisation which the above mentioned conceptualisations lack. Secondly it gives researchers and scholars a powerful insight into examining how managers operate for it spells out clearly the function the manager has to play in an organisation, that is, to regulate the activities and operations of the organisation effectively. Thirdly it gives us an important and valuable measure of performance by which we can examine the effectiveness of managers. With this in mind, cyberneticians state a different purpose to the manager's job. Beer sets the manager's job the purpose of:

1) setting down the criteria of stability
2) recognising and detecting instability
3) and changing the criteria if deemed necessary. (Beer, 1979: 286-287).

If management is the profession of regulation then it is accepted that the manager will use whatever tools or strategies necessary in order to regulate the situation. This means that it is pointless to attempt to specify in detail, as many management researchers attempt to discover, e.g. Stewart, the way a manager spends his time. The manager is embedded in a system, and he has the job to regulate particular operations of the system, and how he spends his time is very
much dependent on the situation that he has to control. It might require the manager to plan, organise, communicate, investigate or it might require him to motivate and train his subordinates. As Espejo notes:

"Therefore studying the management of complexity in any social situation is to undertake inquiries about the strategies used by one viewpoint in its interactions with relevant viewpoints."

He continues thus:

"The strategies used by a viewpoint to cope with the complexity of its black boxes not only imply a particular Weltanschauung (worldview) but also the very complexity of these black boxes" (Espejo, 1985: 12).

This is extremely important for it establishes for the researcher the objective of studying the manager’s strategies in handling the complexity of the situation, and not what managers appear to be doing as exemplified by such studies as that of Stewart, Mintzberg and Kotter, for some managerial activities are not actually to do with managing the situation as noted by Clemson:

"The management of an organisational unit is able to regulate only those aspects of the unit that it has in some sense modelled. The model may be an implicit one, carried in someone’s head, but the management has no way of even noticing (much less managing) those aspects that are not included in their models."

He goes on to say:

"Managers with defective models are in fact not managing their units. This situation may go unrecognized for long periods of time if the unit is not in a highly competitive environment. In such cases the activity of the management is irrelevant or damaging to the unit" (Clemson, 1984: 218).

These statements have serious implications for the way we examine the managerial situation. They give us a new perception to what managers are attempting to carry out in an organisational setting. Beer's work has provided for the author a rich framework to use in the study of the manager-task interaction.
CHAPTER THREE

THE MODEL OF THE STUDY

3.1 Introduction

In the previous chapter major works carried out by researchers in the area of how managers both operate and process information have been reviewed, and major weaknesses and information gaps have been highlighted with respect to those studies. As a way to overcome those weaknesses the author reviewed the area of cybernetics, if only briefly, to highlight a different conceptualisation of management. What the author attempts to do in this chapter is to explain a model that provides a framework to guide the study. First the author presents his own perception of how managers operate and then presents a model based on those perceptions. The purpose of the model is not only to disclose the key structure of the system under study, but also to provide a framework for the author to examine the strategies that managers use to handle the complexity of their task.

3.2 Author's Perceptual Model Of The Interaction Manager-Task

The manager in a way is creating the task, and the task is not independent of the manager. It is his capacity to perceive or recognise that particular task which is going to influence the magnitude, scope and development of that task. The manager has an influence on the shape that that task is going to have. It is the manager himself that can transform the particular task into a sort of exciting, creative type of task or into a dull routine type of task. Thus there is no objective definition of that manager's task in that sense. What exists and what can be examined is the way the manager perceives and defines his task (from his viewpoint). Managerial tasks are very much defined by the manager himself, but
at the same time there is a degree of expectation and perception (represented by the viewpoints of other organisational members) towards that task in an organisation. This takes shape in the form of particular expectations of what that particular manager is supposed to be doing, and thus indirectly defining his 'role'.

However, this in no way defines the manager's task, for the manager is operating in a certain environment, and the task he accepts, in which he gets involved in, has some inherent complexity, which arises not because that complexity is an objective thing, but because the manager accepts and perceives the situational task from a particular perspective.

The manager, having created a model of the situation that he perceives as his task and his job to control (the model is a mental construct), adopts particular strategies to handle the complexity implied by that model. The strategies he uses represent the way he regulates the situation. The manager, no matter what position he holds in an organisation, has basically the job of handling complexity, and the strategies that he uses to handle that complexity represent the way the manager goes about controlling the situation. Now the strategies used by the manager can be effective or ineffective. How effective the strategy is, is very much dependent on a number of factors. It is quite possible that the manager can structure his task to his preference and use whatever strategy to handle its complexity, while at the same time convincing the other organisational members that it is a good way. Or he could disagree with other organisational members on strategy while at the same time achieving the level of performance necessary to satisfy their expectations.

Given the above hypothetical understanding of how managers shape and develop their tasks and strategies, the author sets out below a framework to examine the strategies used by managers to handle the complexity implied by their task.
3.3 A Framework To Guide The Study of Managerial Strategies

Fig 3.1 shows in diagrammatical form the framework to be used to guide the study of strategies used by managers to handle the complexity of their task. It is a three level model that incorporates many of the ideas of Beer, Espejo and a number of other authors. The basis of the model is the manager himself. The manager has a viewpoint, and this viewpoint coupled with the viewpoints of other organisational members define and shape for the researcher the cybernetics of the organisation. What is meant by this is, that in order to understand how managers operate in organisations, the researcher needs to carry out a detailed analysis of the organisation in which the manager is embedded. An understanding of the cybernetics of the organisation, that is how control is distributed within the architecture of the organisation (based on cybernetic laws) is a prerequisite to the enquiry on the manager himself. The reason is that organisations consciously or unconsciously camouflage the real identity and purpose of a particular position by the way they structure and name the various structural positions. Beer's Viable System Model (Beer, 1979) offers a way of overcoming this problem. By analysing the formal organisation structure and then cybernetically interpreting it using Beer's model, we can determine and isolate the various managerial functions, roles and activities existing in any organisation, no matter how complex it appears. The uniqueness of this method is that it allows us to view the managerial activities in light of their immediate organisational environment. This method implies modelling the organisation's complexity in terms of its primary activities down to its lowest recursion levels. This method also enables us to have a more complex understanding of the precise nature of a particular manager's task, in terms of complexity and in terms of the mechanisms and responses that are required to control and regulate these tasks. Further analysis of these structural positions will also enable us to examine other factors, for example whether the manager is
A FRAMEWORK TO GUIDE THE STUDY OF STRATEGIES USED BY MANAGERS TO HANDLE THE COMPLEXITY OF THEIR TASK

viewpoint defines the cybernetics of the organisation defines viewpoints

manager has commitments have organisational members and customers

interpersonal communication system

sets criteria of stability

system for receiving information and monitoring implies need for recognising and detecting instability

system for controlling and regulating distant transformations implies need for changing the criteria if deemed necessary

strategy (lies) to handle

shape

implies inherent complexity

perceived task

has inherent implied by

Fig 3.1

fit

performance

expectations
working with autonomy or discretion or the effect cognitive style has on the information processing behaviour of the manager. By cybernetically isolating each manager's job we are enabled not only to study and compare the way the various cognitive styles perceive and control their tasks, but also to study the various strategies that they use to monitor and regulate their tasks.

In order to understand the cybernetics of the organisation, the researcher needs to study and analyse the managerial viewpoints. By viewpoint is meant how the individual manager perceives the situation that he has to regulate. This requires not only an understanding of the task that he perceives, but also important organisational transformations to which he actually gives 'closure' (to use the language of information processing). Together the viewpoints define the way the organisation operates.

The second level of the model incorporates the cybernetic insight that systems are held together by the communication between the parts. Managers communicate both through formal and informal channels. These communications not only lead to commitments but also help the manager to know what is required of him, and what is going on in other parts of the organisation. Managers need the cooperation of their peers, superiors, and others to regulate their tasks effectively. Some of the operations that they control rely on information processed by other managers. Thus it becomes important for the manager to interact with other organisational members to coordinate and facilitate operations. The model requires the researcher to examine the manager's interpersonal communication system in order to understand how the manager operates.

The third level of the model looks at the manager-task interaction in terms of handling complexity. This level is very much based on the purposes that Stafford Beer attaches to the role of the manager, namely that of setting the criteria of stability, recognising and detecting instability, and changing the
criteria of stability. However for the manager to recognise and detect instability he needs to set up a system that enables him to do this. This implies a need for the researcher to examine the manager's system for receiving information on the operations and activities that the manager perceives he is controlling. This system could be based on formal channels of communication, standardised procedures, shopfloor operator informal reports, management information systems or simply information provided by other people such as the organisation's customers. By understanding the manager's system for recognising and detecting instability we can also understand a good deal about how he operates and how he monitors. Once the manager recognises and detects instability he needs to act to bring the system back to the level of stability that he deems necessary to achieve his objectives. This implies for the researcher that the manager has a system for controlling and regulating distant transformations. This could take shape in the form of meetings with his subordinates, or setting out guidelines or his direct intervention on the shopfloor etc.

It is these three operating systems of the manager; his interpersonal communication system; his system for receiving information and his system for controlling and regulating distant transformations, that shape the strategy or strategies used by the manager to handle the complexity implied by his perceived task. It is these three systems that define the manager's operating mode, the way he actually operates. It is by enquiry into the shape that these systems take that we can begin to understand how managers handle the complexities of their jobs.

The model also highlights the idea of a 'fit'. This is based on the idea that a manager operates in a state of natural tension. The manager as an individual processes environmental information in such a way that he necessarily attenuates variety. However in his role as manager in an organisation the individual is often confronted with demands which he is forced to resolve in real-time. How the manager operates, performs and fulfils the expectations other organisational
members have of him will very much determine the manager's fit in the organisation. If the fit is good and the manager is satisfied with what he is doing and the level of performance he is achieving, and other organisational members are also satisfied, then a state of stability is achieved. Otherwise I would argue, a negative outcome (strain, anxiety) will arise and greatly amplify the natural tension that already exists between the manager's inclination as an individual and what is required of him as a manager.
CHAPTER FOUR

DEVELOPMENT OF TOOLS TO EMPIRICALLY TEST THE MODEL

4.1 Introduction

In the previous chapter the author highlighted the key aspects of his model. This model has highlighted specific areas that need to be examined. The model also reflects a different conceptualisation of management and what managers do. Since this conceptualisation of management totally differs from the main stream of research, it has necessitated the development of new tools and instruments, as those currently employed by researchers in the field of management have proved totally inadequate to test the model. In this chapter the author develops an alternative approach, sub-models and instruments to examine the manager-task interaction. Under the title 'A Method to Study the Interaction "Manager-Task" ' the sub-models and tools are examined and explained. The model in Chapter Three highlighted the need to examine the effect that cognitive style has on the strategies chosen, and a section of this chapter entitled 'A Measure for Cognitive Style' shows a way of examining the manager's cognitive style. The model in Chapter Three also highlighted the need to examine the 'fit' between the manager and the system in which he operates. Under the title 'A Method to Examine the Fit' the author explains a way of examining this fit.

In this chapter the methods outlined to test the model empirically seek only to outline the author's approach and do not reflect a 'best method'. However what it does offer is an alternative approach to those currently being used in the study of how managers operate and the author believes it offers a far richer understanding of the manager-task interaction process.
4.2 A Method To Study The Interaction "Manager-Task"

A pressing problem for any management scholar is determining what instrument to use in order to study how managers operate and how they behave. The number of instruments used, although categorized into one form or another of questionnaires, observation and interviews, appear to be as numerous as there are research papers. Yet when we examine the theories underlying these instruments we find little in terms of a framework to guide future scholars and researchers. This comment applies to such major studies as those of Stewart (1967), Mintzberg (1973) and many others. Yet there are today powerful models which could help researchers to carry out rigorous enquiries in a wide range of settings. These are models based on systems theory and cybernetics. In particular, Stafford Beer’s Viable System Model, offers the researcher a framework by which he can study organisations and the way they operate, and in so doing he is not only using a framework that is applicable to all types of organisations but is also based on a rigorously examined theoretical paradigm.

In approaching the problem of examining the ways managers interact with their tasks, the fundamental question the author had to answer was, once the data on how a particular manager operates had been gathered by what standard was the data to be compared; or to put it another way, what principles are needed in order to determine that the manager was handling the complexity of his job efficiently and effectively. Many researchers report for example on managers operating on "routine" tasks or discuss a manager's particular system of communicating by saying that one manager has communication links with a peer's subordinates while his superior has links with subordinate's subordinates. This method of research only reports on particular situations and adds very little to management theory. What is routine to one manager might not be so routine to another. To study the nature of managerial jobs without describing the systems that they are embedded
in coupled with a lack of framework to guide the analysis of data leads only to further confusion and partial answers.

One solution to this problem is to combine the two existing major approaches of studying managerial jobs, behaviour content approach and process characteristics approach (Whitely, 1985) and guide them by using Beer's VSM, which acts as a powerful framework for the analysis. However, to use Beer's model an extensive database of facts is needed to construct the model not only to structure the system, but also to determine the operating modes of the individual managers. Even Beer's most recent book *Diagnosing the System for Organisations* (Beer, 1985), while very specific in the actual steps needed to carry out a cybernetic study in an organisation, does not outline in specifics the types of information required. A particular solution to this problem is to use Espejo's VIPLAN model (Espejo, 1984) and in particular his Organisational Data and Technological Data Model. These two models are well described by Chan's (1984) study entitled "Modelling Organisational Complexity", carried out under the auspices of Espejo and shown in diagramatical form in Figs 4.1 and 4.2. As a method to study organisations Espejo's models require the researcher to:

1) Establish the identity of the organisation, that is by identifying the business areas of the organisation concerned in terms of both structural diagnosis and structural design.

2) Name those activities that implement the tasks implied by the identity of the organisation.

The Organisational Data Model describes the organisation while the Technological Data Model describes those technological activities recognised by the relevant actors with respect to the business areas that they perceive their organisation is involved in. While at first appearance the models look somewhat
ORGANISATIONAL DATA MODEL

has (belongs-to)

org-entity level

is-at

org-entity

comprises-of

has

belongs-to

primary or functional activity

role

performs

performed-by

EITHER

uses

used-by

input

provides

provided-by

source

primary or functional activity

produces

produced by

activity

perceived-by

perceived by

input

uses

used-by

org-entity function

provides

provided by

source

primary or functional activity

received by

output

receives

received by

destination

Fig 4.1
TECHNOLOGICAL DATA MODEL

Fig 4.3
simplistic in relative terms to the whole of the idea of capturing the complexity of a modern organisation, they represent, when applied, an efficient method for organisational analysis. For the primary purpose of this study even this model needs another instrument to be fully implemented with respect to the objectives of this study.

Another model was developed, the Manager-Task Interaction Model, comprising of three sub-models.

1) The first sub-model examines the manager's system for receiving information on and monitoring of the distant transformations and is shown in Fig 4.3.

2) The second sub-model examines the manager's system for controlling and regulating the distant transformations and is shown in Fig 4.4.

3) The third sub-model examines the manager's interpersonal communication system with organisational members and customers and is shown in Fig 4.5.

To capture the data necessary for the implementation of the three sub-models the Manager-Task Analysis Instrument (MTAI) was formulated in the form of an interview schedule and is shown in Appendix A.

By now the reader will have observed that all five models, the Organisational Data Model (ODM), the Technological Data Model (TDM) and the three sub-models of the Manager Task Analysis Model (MTAM), are in the form of units linked by key-words such as:

```
receives
MANAGER ←→ REPORTS
received-by
```

In the above example both MANAGER and REPORTS represent the units of analysis and both are linked by the key-words receives and received-by. They have been written in this form so that the information contained in the database
MANAGER'S SYSTEM FOR RECEIVING INFORMATION ON AND MONITORING OF THE DISTANT TRANSFORMATIONS

Fig 4.3
MANAGER'S SYSTEM FOR CONTROLLING AND REGULATING THE DISTANT TRANSFORMATIONS

![Diagram of managerial system]

**Fig 4.4**

46
MANAGER'S INTERPERSONAL COMMUNICATION SYSTEM WITH ORGANISATIONAL MEMBERS AND CUSTOMERS

Fig 1.5

47
can easily be accessed using Electronic Data Processing (EDP). The amount of information that can be collected using the interview method can be quite substantial, and one of the reasons why many researchers favour questionnaires over interviewing as a method of collecting data is the final manageability of the data. So by structuring the models in modes of units and key-words it enables the researcher to re-structure the manager’s answers in such a way that they can easily be handled by a computer. For example if in an interview a manager was asked the following question:

Can you describe to me the activities that you perform.

and his answer was:

"Principally I do the buying for the production by placing the orders. I calculate from the sales projection figures given to me by the sales director at the beginning of each month exactly how much material the plant needs and place the material orders accordingly."

This can easily be turned into a number of record statements that form the basis of an information base for the researcher and which can later be accessed depending on the nature of the question that the researcher wishes to pose to the computer. In the above example the record statements generated by the models would be:

production-manager performs buying
buying performed-by production-manager
buying uses monthly-sales-projection-figures
monthly-sales-projection-figures used-by buying
monthly-sales-projection-figures provided-by sales-director
sales-director provides monthly-sales-projection-figures
buying produces materials-order
materials-order produced-by buying
materials-order received-by supplier
supplier receives materials-order

To generate these statements data sheets were prepared (see Appendix B) to simplify the process somewhat. However as can be seen from the above example
it takes many record statements both to describe adequately a particular managerial situation and the information processing system and loops that the manager is involved in. What was required was a computer program to generate multiple record statements given a limited amount of information fed in by the researcher. A BASIC program comprising nearly two thousand statements was written using an IBM personal computer (see Appendix C) that had three main functions:

1) The first function generates record-statements based on the ODM and the TDM.

2) The second function enables limited analysis of managerial and organisational activities using pre-structured forms of analysis.

3) The third and main function takes the record-statements and re-write them in the form of prolog statements so that they can be read using a fifth generation computer language called micro-Prolog (McCabe et al, 1984).

The basic structure of the program is shown in Appendix C. The need to link the program with micro-Prolog was necessary to enable flexibility in the structuring of the questions that the researcher can pose. Once the data in the form of prolog record statements are loaded onto micro-Prolog the researcher can then query the database within the limits of the units and key-words. For example if he wanted to find out what reports a particular manager is receiving in order to determine the structural levels he is controlling and monitoring, a query is posed to the computer in the form of:

which (x1 x5: x1 received-by technical-manager and x1 produced-by x2 and x2 performed-by x3 and x4 has x3 and x4 is-at x5)

The computer will then list all the reports and the respective structural level the report was generated from.
Using all these instruments the researcher is able to carry out a very extensive and in-depth study of not only the system in which the managerial activities are embedded but also how particular managers are operating. However this is only one of two major steps. The second and more important step is to base the critical analysis and mode of operation in the light of Beer's Viable System Model. For it is this model that acts as a framework, a standard, if you like, to determine whether or not the manager is using his abilities in the management of complexity efficiently and effectively. At present the cybernetic rules necessary to carry out this sort of analysis automatically by the computer, in the form of an expert systems package, is underway by Espejo. However the complexities in producing such a package are immense for the rules must apply to all organisations. In the meantime cybernetic analysis can be carried out manually using an intuitive understanding of Beer's work.

4.3 A Method To Examine The Fit

In the previous chapter the author noted that how the manager operates, performs and fulfils the expectations that other organisational members have of him will very much determine the manager's fit in the organisation. By using cybernetic insights we can gain a valuable understanding that will enable us to create a framework that will facilitate the process of examining this fit.

Managers like other living systems strive for homeostasis. That is, they attempt to maintain a steady state by keeping a number of variables, that represent the conditions of survival, in balance. For the manager these variables are of two major types. The first type is represented by the variables associated with the task of his concern. The second type is represented by the variables associated with the expectations that the organisational members have of him. The manager's behaviour in the organisation reflects the method he uses to
maintain a steady state for both his task and his own position vis-a-vis the organisation. If the manager perceives that the situation which he has to control is not going well, that is homeostasis is not being achieved, then he may start to develop cognitive strain. Cognitive strain comes about as a result of the manager cognitively recognising that what is happening does not meet his cognitive criteria of stability. Since his aim is to maintain homeostasis, he will then employ whatever strategy he can to bring the situation back into what he perceives as its range of stability. Thus continued strain for the manager represents an inability to cope with the task of his concern. This could be as a result of the strategy he is using (not achieving the desired purpose), or it could be as a result of not having the resources to handle the situation.

In Chapter Two the author highlighted the findings of Miller (1960) with respect to the mechanisms used by individuals to handle variety. However managers differ from individuals in that they are provided with information that they have to give closure to. Managers in choosing a strategy are quite often restricted not only by organisational resources at their disposal but also by the very structure that they operate in. By examining the manager's operating mode and the cybernetics of the organisation of which he is part, and relating these to the level of cognitive strain the manager has, not only can we examine how the manager perceives his fit in the organisation but we can also seek to explain the very reason for the strain.

There have already been numerous attempts to construct a 'person-environment fit model' based on occupational stress by psychologists (French et al, 1974 and Van Harrison, 1978). However, many of these models lack the strong theoretical framework of cybernetics, a necessary requisite to isolate and understand the role of an individual manager in an organisation.

The literature in the area of stress/strain is quite vast, and the total number of research papers and books is said to number over half a million.
However, a unique paper in this area by Cummings et al incorporates cybernetic insights in an attempt to bring about a coherent framework for the study of stress/strain. They defined some major terms, quite often confused and not clearly agreed on in the stress literature, which will be referred to throughout the rest of this study:

"A stress is any force displacing a variable beyond its range of stability. Stress produces strain within the organism (that which pushes a variable beyond its range of stability). Coping is when the organism acts to restore its steady state and adjustment processes is the individual behaviour directed at maintaining a steady state. These processes are aimed at reducing deviations from the individual's preferred state" (Cummings et al, 1979: 397-398).

These terms imply to a certain extent the need to examine the natural cognitive state of the individual manager (how he normally feels) and the situational cognitive state (which is the state he is at following stress). The difference between the two determines whether that individual is strained or not, and to what extent he is strained. But managers face many different kinds of stresses when interacting with their working environment. It thus becomes important to recognise and to isolate those type of stresses, if not specifically then at least by category. This is not an easy task, as many existing strain instruments developed by psychologists were not specifically targeted for managerial samples, but rather for general populations. One way to partially overcome this problem is to use established and good measures of strain and validate the results by reviewing them with the manager concerned. This would permit the filtering out of any kind of strain that arises from non-work situations, such as death of a spouse, family problems and so on.

Having reviewed many stress/strain/anxiety instruments in the literature it was decided by the author that two instruments, the State Trait Anxiety Inventory (STAI) and the Personal Strain Questionnaire (PSQ), could be used as measures of fit.
4.3.1 The State-Trait Anxiety Inventory (STAI)

With respect to the STAI, the concepts of state and trait anxiety were first introduced by Cattell (1966), and later further elaborated by Spielberger (1966) who is the author of the STAI. Spielberger in the STAI manual defines both concepts of state and trait anxiety:

"Trait anxiety (T-anxiety) refers to relatively stable individual differences in anxiety-proneness, that is, to differences between people in the tendency to perceive stressful situations as dangerous or threatening and to respond to such situations with elevations in the intensity of their state anxiety (S-anxiety) reactions" (Spielberger, 1983: 1)

Joesting (1975) and Metzger (1976), while agreeing with Spielberger on the definition of trait anxiety, put forward a definition of state anxiety:

"A transitory emotional state that is characterized by consciously perceived feelings of tension and apprehension" (Joesting, 1975: 270).

"A momentary condition of the organism. This condition is subject to continual fluctuation as a result of temporal changes in the environment" (Metzger, 1976: 276).

The STAI (see Appendix E) is a self-report questionnaire consisting of forty questions and is divided into two scales. The S-anxiety scale consists of twenty questions whose purpose is to determine how the individual feels at the moment of responding, and the T-anxiety scale consists of twenty questions whose purpose is to determine how the individual generally feels. The STAI is widely used by psychologists and other researchers as noted by Katkin:

"Research with the State-Trait Anxiety Inventory has been proliferating to the point where there is probably more published research on the STAI, and more ongoing research now on the STAI, than any other commercially available anxiety inventory" (Katkin, 1978: 1096).

The basic reason for this is not only the availability of a large number of validity papers on it but also to some extent the wide acceptance of the underlying theory on which it is based.

With respect to validity studies carried out on the STAI, Spielberger (1983)
reports on internal consistency using alpha reliability coefficients on a sample of 377 high school juniors, 982 college freshmen and 484 college students taking a psychology course as being:

State Anxiety .83 to .92
Trait Anxiety .86 to .92

Newmark also reports on alpha reliability coefficients ranging from .89 to .94 based on 186 university students tested on four different occasions (ranging from 1 day to 10 months) and concludes:

"The results generally support Spielberger's (1966) theoretical conceptualization of anxiety phenomena that posits two anxiety constructs and demonstrated that A-state measures, even though appearing stable over a relatively short period of time, were sensitive to changes in environmental stress of every day living."

he continues by stating:

"The findings further suggest the reasonably good internal consistency of both STAI subscales as evidenced by the high alpha coefficients" (Newmark, 1972: 198).

Bartsch et al's study, using a sample of 104 college students and attempting to clarify the nature of the state-trait anxiety distinction using an R-technique factor analysis procedure, gives support to the construct validity of the STAI:

"(a) the trait-state distinction in anxiety research manifests a degree of construct validity both in terms of differential tendency of individuals classified on the trait dimension to exhibit adaptation, in terms of state anxiety responses, to the experimental setting and (b) the current trait and state anxiety questionnaires do define measurably distinct constructs (factors) which manifest appropriately different levels of temporal stability" (Bartsch et al, 1973: 63).

However a study by Barker et al (1977), using a sample of 207 graduate students, while agreeing with Spielberger's A-State concept, identified two separate factors neither of which was consonant with Spielberger's concept of A-Trait. The first is that it appeared to tap state anxiety as remembered over an indefinite period of time, the second is that it could be interpreted as a measure of neuroticism. Kendall et al (1976) also conclude with respect to the STAI that:
"the A-trait scale measures only one dimension of trait anxiety, a
cognitive dimension of ego involvement or fear of failure" (Kendall et

With respect to test-retest reliabilities on the STAI there are numerous
studies. Spielberger reports in the manual of the STAI test-retest reliabilities
ranging from .73 to .86 on the trait scale and .16 to .31 on the state scale.
Joesting (1977) reports on a 45 minute interval test-retest correlations for 105
students as ranging from .66 to .83.

With respect to the concurrent validity of the STAI Spielberger reports on
correlations between the trait anxiety scale and other measures of trait anxiety as
being:

<table>
<thead>
<tr>
<th></th>
<th>126 college females</th>
<th>80 college males</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPAT Anxiety Scale</td>
<td>.75</td>
<td>.76</td>
</tr>
<tr>
<td>Manifest Anxiety Scale</td>
<td>.80</td>
<td>.79</td>
</tr>
<tr>
<td>Affect Adjective Check List</td>
<td>.52</td>
<td>.58</td>
</tr>
</tbody>
</table>

However one problem that does exist with using the STAI is its proneness to faking
as noted by Smith based on a sample of 283 paid student volunteers:

"the findings indicate that STAI scores are quite susceptible to
intentions to exaggerate stress effects, just as these scores are readily
influenced by other response sets. It is also clear that the STAI user
can screen records for the "fake bad" type of bias with relatively little
effort and with considerable effectiveness" (Smith, 1974: 244).

4.3.2 The Personal Strain Questionnaire (PSQ)

The Personal Strain Questionnaire (PSQ), see Appendix F, is one of three
instruments, the other two being the Occupational Environment Scale and the
Personal Resources Questionnaire, that were developed by Osipow et al (1983) in
an attempt to develop a rationale to link stress, coping and strain and measure
them in a consistent fashion.

The initial intention of the author of this study was to use all three
instruments. However, upon examination of the total number of questions
involved in the three instruments (one hundred and forty questions), coupled with the number of questions on the State-Trait Anxiety Inventory (forty questions) and the measure for cognitive style, the Myers-Briggs Type Indicator, (one hundred and twenty-six questions), it was decided that it would be too much for the potential managers to respond to. It was thus decided to just use the PSQ as it served the initial purpose of the study and because the PSQ manual states that "each of the scales is self-contained and self-administered and can be used separately if desired".

Osipow et al classified strain into four major categories, these being:

(a) Psychological
(b) Physical
(c) Interpersonal/behavioral
(d) Vocational.

The PSQ consists of four sub-scales, each dealing with one of the above-mentioned categories and consisting of ten questions per sub-scale, and whose purpose is to "measure the extent to which the respondent is having problems in work quality or output (Vocational Strain), measure the extent of psychological adjustment and or mood problems (Psychological Strain), measure the extent of disruption in interpersonal relationships (Interpersonal Strain), and measure complaints about physical illness (Physical Strain)".

The purpose of using the PSQ is to isolate, at least by category, the basis of the stresses originating from the manager's working environment. Thus by using the two major questionnaires, the STAI and the PSQ, not only can the author determine if the manager is strained but also identify the source of that strain.

The only problem resulting from the use of the PSQ is that it is a fairly new questionnaire and few validation studies exist on it. The majority of studies carried out using the PSQ seem to be concentrated at the University of Maryland in the form of thesis and dissertations and carried out probably under the auspices
of the authors of the PSQ. However, this should not deter researchers from using the instruments as they are based on strong theoretical works of a number of authors in the stress/strain literature. Studies such as this one can only help to falsify this instrument and add to the corpus of theory.

Osipow and Spokane report in the manual on the internal consistency of the PSQ, using Cronbach Alpha coefficient and an initial sample of 201 employed adults as being .92. The two week test-retest reliability they report as ranging from a low of .56 to .94. They also report on correlation studies in an effort to "form a nomological network of relationships to a number of work related variables". One study examined the relationship between personal strain and two psychological variables, locus of control and person-environment congruence. No significant relationship was found between personal strain and the two psychological variables.

4.4 A Measure For Cognitive Style

Choosing a valid and accurate measure for cognitive style is of critical importance for this study. However the task has not been easy. There are numerous instruments, each supported by a large number of researchers and specific schools of thought. The choice of an appropriate measure has been one of considerable debate in the management literature (Keen et al, 1981; Robey et al, 1981, 1983; Schweiger, 1983). The 1981 Robey et al study provides a good analysis of some of the major instruments that have been used. Two major approaches have been used; physiological state indicators such as EEG monitoring and psychological tests such as Huysman's measurement, the Embedded Figures Test, Vaszkhelyi Questionnaire, Minnesota Questionnaire, the Myers-Briggs Type Indicator, the Keen tests and the Kolb Learning Style Inventory.

However, in many of the above-mentioned instruments there exists
fundamental problems which do not lend themselves to be used in an empirical study of this nature. As Taylor et al correctly conclude, many cognitive style research studies suffer from two major problems that must be clearly recognised in choosing an appropriate measure for cognitive style. They write:

"(1) Most cognitive styles are loosely defined and based upon only rudimentary theories.
(2) To be interpreted meaningfully, measures of psychological characteristics must demonstrate adequate reliability and validity" (Taylor et al, 1980: 84-85).

Keen et al reviewed and critically examined cognitive style research instruments. They made a strong case "for the use of the Myers-Briggs Type Indicator as the base for cognitive style research".

The logic behind their proposition is that:

(1) It is based on a theoretical strong paradigm of psychological type derived from Jung that has been of substantial influence on research in or related to the MIS field.
(2) The MBTI has been shown to be a reliable measure.
(3) Empirical results gathered by a number of authors over a period of five years indicate the power of the MBTI to "discriminate behaviour relevant to information systems design and use". (Keen et al, 1981: 24).

Using Bagozzi's framework (1980), which identifies six aspects of validity in behavioural measures, the authors evaluated the various existing cognitive models and concluded that the only measure, apart from the MBTI, that merits serious consideration is the Witkin's Embedded Figures Test (EFT) (1964). However, they continue:

"The overall case for EFT has not been made yet. If it can be, the EFT may be better suited to studies of the psychology of individual cognitive differences where performance rather than preference or behaviour is the focus of interest than is the MBTI" (Keen et al, 1981: 47).

In a review of what the author believes to be among the most relevant papers in the area of management cognitive research, seventeend out of twenty-four papers either proposed or used the MBTI as the cognitive measure for their research (see Table 4.6). Major findings by a number of authors using the MBTI are summarised in Tables 4.7 to 4.11.
<table>
<thead>
<tr>
<th>Authors</th>
<th>Year</th>
<th>Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bariff &amp; Lusk</td>
<td>1977</td>
<td>EFT + Bieri Cognitive Complexity Test</td>
</tr>
<tr>
<td>Blaylock &amp; Winkofsky</td>
<td>1983</td>
<td>MBTI</td>
</tr>
<tr>
<td>Davis</td>
<td>1982</td>
<td>MBTI</td>
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<tr>
<td>Dermer</td>
<td>1973</td>
<td>Rokeach’s Dogmatism Scale</td>
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<tr>
<td>Doktor &amp; Hamilton</td>
<td>1973</td>
<td>EFT</td>
</tr>
<tr>
<td>* Ghani &amp; Lusk</td>
<td>1982</td>
<td>EFT</td>
</tr>
<tr>
<td>Gruenfeld</td>
<td>1975</td>
<td>EFT</td>
</tr>
<tr>
<td>Hellriegel &amp; Slocum</td>
<td>1980</td>
<td>MBTI</td>
</tr>
<tr>
<td>Henderson &amp; Nutt</td>
<td>1980</td>
<td>MBTI</td>
</tr>
<tr>
<td>* Keen &amp; Bronsema</td>
<td>1981</td>
<td>MBTI</td>
</tr>
<tr>
<td>* Kilmann &amp; Mitroff</td>
<td>1976</td>
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<tr>
<td>Kleiner</td>
<td>1983</td>
<td>MBTI</td>
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<td>Lewis &amp; Hibbert</td>
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<td>Margerison et al</td>
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<td>MBTI</td>
</tr>
<tr>
<td>* Mason &amp; Mitroff</td>
<td>1973</td>
<td>MBTI</td>
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<tr>
<td>McGhee et al</td>
<td>1978</td>
<td>Intolerance of Ambiguity Test + Integrative Style Test</td>
</tr>
<tr>
<td>McKenney &amp; Keen</td>
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<td>Mintzberg</td>
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<td>Nugent</td>
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<tr>
<td>Steckroth et al</td>
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<td>Taggart &amp; Robey</td>
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* denotes, author proposes the use of the MBTI.

Table 4.6
<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>SENSATION/THINKING</th>
<th>INTUITION/THINKING</th>
<th>SENSATION/FEELING</th>
<th>INTUITION/FEELING</th>
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</thead>
<tbody>
<tr>
<td>Type of Roles</td>
<td>Applied Science, Production (7) Where there is no uncertainty as to what is expected (3)</td>
<td>Physical Science, Research Management, Forecasts &amp; Analysis (7) Dealing with environmental uncertainty and no precise method to solve the problems (4)</td>
<td>Sales (7)</td>
<td>Behavioral Science, Research (7)</td>
</tr>
<tr>
<td>Individual Usually Found In</td>
<td>Practical (3) Traditionalist Judicial (8)</td>
<td>Theoretical (3) Visionary (8)</td>
<td>Social (3) Troubleshooter (8)</td>
<td>Idealistic (3) Catalyst (8)</td>
</tr>
</tbody>
</table>

**Please note that the type of cognitive or processing style was determined using The Myers-Briggs Type Indicator (MBTI) based on Carl Jung's psychological types.**

**References**

1. Taggart; Robey (1981)
2. Slocum (1978)
3. Mitroff; Kilmann (1975)
4. Hellriegel; Slocum (1980)
5. Mitroff; Barbara; Kilmann (1977)
7. Myers (1962)

Table 4.7
<table>
<thead>
<tr>
<th>FOCUS OF ATTENTION</th>
<th>SENSATION/THINKING</th>
<th>INTUITION/THINKING</th>
<th>SENSATION/FEELING</th>
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<tr>
<td>FACTS (1,7) SPECIFICS &amp; FACTUAL DETAILS (2,3) ORGANIZING &amp; KEEPING THE SYSTEM RUNNING (4)</td>
<td>POSSIBILITIES (1,7) GENERAL CONCEPTS &amp; ISSUES (2,3) POLITICAL &amp; POWER COALITIONS THAT FORM IN ORGANIZATIONS (4)</td>
<td>FACTS (1,7) DETAILED HUMAN RELATIONS IN THEIR ORGANIZATION OR DEPARTMENT (2,3)</td>
<td>POSSIBILITIES (1,7) BROAD GLOBAL THEMES (2,3)</td>
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<tr>
<td>IMPERSONAL ANALYSIS (1,7) ANALYSIS, LOGIC, AND DECISIVENESS (7)</td>
<td>IMPERSONAL ANALYSIS (1,7) LOGICAL, CRITICAL, DECISIVE DETERMINED (7)</td>
<td>PERSONAL WARMTH (1,7) LOYALTY, CONSIDERATION &amp; THE COMMON WELFARE (7)</td>
<td>PERSONAL WARMTH (1,7) GLOBAL APPROACH TO ISSUES &amp; PROBLEMS (5)</td>
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<th>INTUITION/FEELING</th>
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<tr>
<td>IAS CONCERNS IN</td>
<td>THE INTELLECTUAL AND THEORETICAL CONCEPTS OF ORGANIZATIONS IN GENERAL THAN WITH EFFICIENCY. (3)</td>
<td>HUMAN QUALITIES OF THE SPECIFIC PEOPLE WHO FILL THE ROLES. THE INTERPERSONAL ENVIRONMENT. (3)</td>
<td></td>
<td>LONG-TERM ORIENTATION OF THE ORGANIZATION. (2)</td>
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<td>IAS TENDENCIES</td>
<td>TO ESTABLISH ELABORATE SET OF RULES &amp; PROCEDURES TO CREATE A STABLE AND PREDICTABLE SET OF ROLES. (4)</td>
<td>TO ESCALATE STANDARDS &amp; STAND BY THEIR DECISIONS. (4)</td>
<td></td>
<td>TO TREAT PROBLEMS FROM A PERSONAL, HUMAN, MORAL &amp; ETHICAL POINT OF VIEW. (5)</td>
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<tr>
<td>VALUES</td>
<td>RELATEDNESS SOCIAL BELONGING. (8)</td>
<td>COMPETENCY ABILITY KNOWLEDGE CAPABILITIES. (8)</td>
<td>FREEDOM SPONTANEITY ACTION. (8)</td>
<td>INTEGRITY AUTHENTICITY MEANING WORTH. (8)</td>
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<td>THE CEREBRAL HEMISPHERE PROCESSING USED</td>
<td>LEFT (1)</td>
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<td>RIGHT (1)</td>
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Table 4.9
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<th>INTUITION/THINKING</th>
<th>SENSATION/FEELING</th>
<th>INTUITION/FEELING</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TYPE OF ORGANIZATION PREFERRED</strong></td>
<td>ONE IN WHICH EVERYBODY KNOWS EXACTLY WHAT HIS JOB REQUIRES &amp; THE DETAILS ARE SET IN A MANUAL OF RULES AND NEGOTIATIONS (2,3) HIGH DEGREE OF STRUCTURE AND WELL ESTABLISHED COMMUNICATION CHANNELS. (6) BUREAUCRATIC. (3)</td>
<td>IMPERSONALLY IDEALISTIC. (3) ONE THAT ENCOURAGES CONSTANT FEEDBACK AND PROVIDES ITS OWN GOALS, CONTROLS, DIVISIONS OF LABOUR AND MOTIVATION AND REWARD STRUCTURES. (2,3) COMPLEX. (3)</td>
<td>WELL DEFINED SET OF RULES &amp; REGULATIONS A CENTRALIZED ORGANIZATION. (4) FRIENDLY, HIERARCHICAL BUT OPEN. (3)</td>
<td>COMPLETELY DECENTRALIZED. NO CLEAR LINES OF AUTHORITY NO CENTRAL LEADER, AND NO FIXED, PRESCRIBED RULES OF BEHAVIOR. (2,3) NO STRONG LEADERSHIP. (4) IDEALISTIC ORGANIC, ADAPTIVE INSTITUTIONS. (3) DEMOCRATICALLY RUN. (4)</td>
</tr>
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<td><strong>PREFERS ORGANIZATIONAL GOALS TO BE</strong></td>
<td>REALISTIC DOWN-TO-EARTH LIMITED AND MOST OFTEN NARROWLY ECONOMIC (2,3)</td>
<td>DEVELOPED IN RESPONSE TO THE INTERRELATION BETWEEN ENVIRONMENTAL AND MEMBER GENERATED FACTORS (2,3)</td>
<td>SERVING THE PERSONAL &amp; SOCIAL NEEDS OF PEOPLE (2,3)</td>
<td></td>
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Table 4.10
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<thead>
<tr>
<th>VARIABLE</th>
<th>SENSATION/THINKING</th>
<th>INTUITION/THINKING</th>
<th>SENSATION/FEELING</th>
<th>INTUITION/FEELING</th>
</tr>
</thead>
<tbody>
<tr>
<td>TYPE OF REPORTS PREFERRED</td>
<td>HIGHLY DETAILED &amp; SPECIFIC, &amp; WHICH OVERWHELMINGLY DEAL WITH TECHNICAL OR SCIENTIFIC ISSUES. (5)</td>
<td>HIGHLY GLOBAL, BROAD, FAR-RANGING &amp; WHICH DEAL WITH A WIDE RANGE OF OVERWHELMINGLY TECHNICAL/SCIENTIFIC ISSUES. (5)</td>
<td>HIGHLY DETAILED &amp; SPECIFIC, &amp; WHICH OVERWHELMINGLY DEAL WITH INDIVIDUAL PERSON ISSUES. (5)</td>
<td>HIGHLY GLOBAL, BROAD, FAR-RANGING &amp; WHICH DEAL WITH A WIDE RANGE OF OVERWHELMINGLY HUMAN, MORAL &amp; ETHICAL ISSUES. (5)</td>
</tr>
<tr>
<td>AS A PROBLEM ANALYST HE PREPERS</td>
<td>DEFINING SOLUTIONS (8)</td>
<td>DEFINING PROBLEMS (8)</td>
<td>IMPLEMENTING SOLUTIONS (8)</td>
<td>PROBLEM AWARENESS (8)</td>
</tr>
<tr>
<td>WEAKNESSES</td>
<td>IMPATIENT WITH PROJECTS DELAYED BY COMPLICATIONS. INCLINED TO DECIDE ISSUES TOO QUICKLY. NOT RESPONSIVE TO RAPID CHANGE. (8)</td>
<td>POOR EVALUATOR &amp; DAY-TO-DAY ADMINISTRATOR. (6) IMPATIENT WITH ERRORS AND GOING OVER THE SAME TERRITORY ONCE A DECISION HAS BEEN MADE. (4)</td>
<td>REFUSES TO ACKNOWLEDGE UNPLEASANT FACTS OR SITUATIONS. AVOIDS DIRECT CONFRONTATION LEAVING RESPONSIBILITY TO SOMEONE ELSE. (6)</td>
<td>POOR DAY-TO-DAY ADMINISTRATIVE CAPABILITIES. (6) VULNERABLE TO SUBORDINATE EMOTIONS. ALWAYS SEEKING SUPPORT. (4)</td>
</tr>
</tbody>
</table>

Table 4.11
The MBTI, see Appendix D, is a self-administering questionnaire consisting of one hundred and twenty-six forced-choice items (Form G). According to Myers the purpose of the indicator is

"to implement Jung's theory of type (1923). The gist of the theory is that much apparently random variation in human behaviour is actually quite orderly and consistent, being due to certain basic differences in the way people prefer to use perception and judgement" (Myers, 1962: 1).

Many researchers note two main advantages in using the Jungian typology, here briefly summarized by Kilmann et al.

"(1) the dimensions of the Jungian typology can be directly related to different managerial and organizational styles; as a result, the system helps to shed light on a wide variety of organisational and managerial phenomena; (2) the Jungian typology does not prescribe one of the four major personality types as superior or better than any of the others but instead points out that each type has major strengths as well as weaknesses" (Kilmann et al., 1976: 18).

The MBTI consists of four separate indices:

- **The Thinking-Feeling (T-F) Scale** which measures the person's preferred approach to information evaluation.

- **The Sensation-Intuition (S-N) Scale** which measures the person's preferred way of information gathering.

- **The Judgement-Perception (J-P) Scale** which measures the way the individual goes about his decision-making process.

- **The Extroversion-Introversion (E-I) Scale** which measures a person's preferred orientation towards interpersonal interactions.

Given that there are two attitudes to each of the above mentioned functions, and the different ways that they can be combined, ie ESTJ, ISTJ etc,
this leads to sixteen possible Jungian Types that can be identified using the Indicator. The Indicator comes with an answer sheet and scoring keys for translating the different answers into preference scores.

There exists a considerable research base dealing with reliability and validity studies for the MBTI. Apart from those reported by Myers (1962) in the accompanying manual, there are two major studies, (Stricker et al., 1963) and (Carlyn, 1977) that have been carried out. It is the objective of this section of the study to examine the following for the MBTI:

A) Reliability
   (i) Stability over time.
   (ii) Internal Consistency.

B) Validity
   (i) Predictive Validity.
   (ii) Concurrent Validity.
   (iii) Construct Validity.

Carlyn (1977) reports of four studies dealing with the stability of type-category scores. Using test-retest data; Levy et al. (1972), Stalcup (1967), Stricker et al. (1964) and Wright (1966) examined the proportion of agreement between the original and the retest, and found the MBTI to have the following ranges for each of the four indexes:

Extroversion-Introversion 62% to 83%
Sensation-Intuition 57% to 89%
Thinking-Feeling 61% to 90%
Judgement-Perception 66% to 90%.
Howes et al (1979) found that the MBTI scores of psychology students changed somewhat less than scores using the Sixteen Personality Factors Test. As to the stability of the continuous scores only two studies are reported, Levy et al (1972) and Stricker et al (1964). Their results between the original and the retest was found to have the following ranges for each of the four indexes.

- Extroversion-Introversion 73% to 83%
- Sensation-Intuition 69% to 78%
- Thinking-Feeling 48% to 82%
- Judgement-Perception 69% to 82%

In terms of internal consistency of the type-category scores, three studies are reported, Stricker et al (1963), Webb (1964) and Myers (1963). The Stricker et al (1963) and Webb (1964) studies used a lower bound estimates of reliability with Guttman's procedures, and reported reliabilities in the 40s and 50s (Stricker et al study). Webb (1964) and Myers (1963) estimated split-half reliabilities by calculating phi correlation coefficients and applying the Spearman-Brown prophecy formula. In fact it is Myers (1962) who recommends when determining the internal consistency of the type-category scores, to use estimate split-half reliabilities by calculating tetrachoric correlation coefficients and applying the Spearman-Brown formula. Three researchers, Hoffman (1974), Myers (1962) and Webb (1964) reported the following results by applying the Spearman-Brown Prophecy formula to:

<table>
<thead>
<tr>
<th></th>
<th>Phi Coefficients</th>
<th>Tetrachoric r</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extroversion-Introversion</td>
<td>.55 to .65</td>
<td>.70 to .81</td>
</tr>
<tr>
<td>Sensation-Intuition</td>
<td>.64 to .73</td>
<td>.82 to .92</td>
</tr>
<tr>
<td>Thinking-Feeling</td>
<td>.43 to .75</td>
<td>.66 to .90</td>
</tr>
<tr>
<td>Judgement-Perception</td>
<td>.58 to .84</td>
<td>.76 to .84</td>
</tr>
</tbody>
</table>
As to the internal consistency of continuous scores three studies are reported, Myers (1962), Webb (1964) and Stricker et al (1963). Myers and Webb developed a split-half procedure involving Pearson product-moment correlations, while Stricker et al used Cronbach’s coefficient alpha. The Stricker et al study gave coefficients in the following ranges:

- Extroversion-Introversion \(=.76 \text{ to } .83\)
- Sensation-Intuition \(=.74 \text{ to } .80\)
- Thinking-Feeling \(=.64 \text{ to } .74\)
- Judgement-Perception \(=.78 \text{ to } .84\)

Predictive Validity studies were carried out by Goldschmid (1967), Conary (1966), Stricker et al (1965), Myers et al (1964), Carlson et al (1973), and Saunders (1957); all used students as their subjects, and all coming up with a moderate predictive ability. However there are numerous studies that support the predictive validity of the MBTI but a large proportion of them use students as their subjects, with practically none existing using managers as their subjects.

Concurrent Validity studies are quite numerous, showing comparisons of the MBTI with similar scales. Myers (1962) reports on correlations with the Gray-Wheelwright Psychological Type Questionnaire which has the same purpose as the MBTI, that is to identify the Jungian types. The following results were obtained:

<table>
<thead>
<tr>
<th>EI</th>
<th>SN</th>
<th>TF</th>
<th>JP</th>
</tr>
</thead>
<tbody>
<tr>
<td>.79</td>
<td>.58</td>
<td>.60</td>
<td>No scale</td>
</tr>
</tbody>
</table>

Other correlations are reported with interests as shown by Strong Vocational Interest Blank, with needs as measured by Edwards Personal Preference Schedule, the Personality Research Inventory and the Allport-Vernon-Lindzey Study of
Values. Steele et al (1976) also demonstrate a high extroversion-introversion correlation between the MBTI and the Eysenck Personality Questionnaire, and Lake et al (1973) report correlations of .63 to .75 with the extroversion scale of the Maudsley Personality Inventory.

Research papers dealing with the construct validity of the indicator, that is whether the four indexes really measure the various cognitive types postulated by Carl Jung's theory, are numerous. But one major paper by Stricker et al (1964b) is widely quoted in the literature and is one of considerable debate. Based on the analysis of these authors only the SN and TF scales may actually reflect those postulated by Jung's theory (the EI and JP are questionable). However Carlyn's study, which is based on a review of a large number of studies, concluded:

"the numerous studies of construct validity summarized above suggest that the individual scales of the Myers-Briggs Type Indicator measure important dimensions of personality which seem to be quite similar to those postulated by Jung" (Carlyn, 1977: 471).

Keen et al make an important point in their review of the Construct Validity of the MBTI:

"Construct validity: The MBTI seems methodologically sound in this respect. It must be acknowledged, of course, that personality and trait-based theories in general and style models in particular are contentious and in some respects the preference for a particular psychological tradition is a matter of axioms and taste" (Keen et al, 1981: 45).

The MBTI has been shown to have the necessary reliability and validity requirements necessary for this research study. Not only has it been shown to be methodologically sound but is based on a well-based theoretical paradigm of psychological types postulated by Carl Jung. While it continues to suffer from some criticism, mainly because of the nature of its forced-choice questions and at times the relationship between personality and type preference is questionable, it has, however, emerged as the standard for cognitive style research.
CHAPTER FIVE

METHOD OF DATA COLLECTION, PREPARATION AND ANALYSIS

5.1 Introduction

The objective of this chapter is to show the three major stages that were used in the handling of the empirical data. The three stages being data collection, data preparation and data analysis. The objective of this chapter is not to show a "best method" in applying the scientific models discussed in the previous chapter but rather to show how the author went about the process of applying the models and to show the advantages and disadvantages of using such a method.

5.2 Stage One: Data Collection Process

In December of 1984 a letter was sent out to twenty organisations in the West Midlands area outlining the purpose of the study and requesting each organisation to participate in the study by allowing their managers to be interviewed and allowing the author access to necessary organisational information. The organisations were chosen at random from a catalogue and listing of organisations in the West Midlands area. This drew only seven responses of which all were negative mainly due to the fact that they were either carrying out a major reorganisation (and thus felt it was an inappropriate time to carry out the study), or were at the time either participating in some form of university research or had just finished doing so and felt that they could not afford further managerial time.

In February two organisations were approached through personal contacts at Aston University. Both organisations agreed to a preliminary meeting to discuss the study. For this meeting a two page report on the study was prepared
at the request of the respective managing directors. The report gave:

(1) A brief background and introduction to the study
(2) Information on the purpose of the study
(3) Background and information on the instruments to be used in the collection of the data
(4) Amount of time required to carry out the study in the organisation.

The first organisation (Company A) agreed during the preliminary meeting to the study and went ahead and scheduled all of its managers for interviews. However the total number of managers in Company A was rather small with only eight managers, and it was decided that it would be best to treat it as a pilot study with the purpose of testing the instruments and learning from the process. Although the managing director agreed to the study he pointed out that in the end it would be up to the individual manager and my ability to convince the other managers to participate in the study. Copies of the two page report were then distributed by the managing director to each individual manager. Following the eight managers' approval to participate in the study the interviews were scheduled. At the interview each manager was told that the results of the questionnaires were to be treated in strict confidence and only he would have access to the results, however the results of the interviews were to be incorporated into a final report for the organisation as a whole. The method of responding to the three questionnaires was then explained and each manager was asked to have them ready for collection approximately a week after the interview. Permission was then requested from each manager to carry out the interview on tape. A small micro recorder was used to record the interview data and in no case did any manager refuse the use of the tape recorder. The taping of the interviews appeared to have had little effect in the response of the managers to the questions and most managers in all the organisations were very frank and open in their responses. The first part of the interview was directed at
establishing the position and responsibilities of the individual manager. The interview schedule was used as the framework in posing the questions to the manager. That is, the questions shown in the interview schedule (Manager-Task Analysis Instrument) were not actually put forward in the manner shown but rather modified depending on the person being interviewed. With some managers it was necessary to spend a greater amount of time in establishing their positions and activities. For example when interviewing a senior manager or director a greater emphasis was put on trying to capture his involvement in the formulation of policies and System 4 intelligence activities, while with lower level managers a greater emphasis was put on trying to understand how the technological activities are actually carried out. Some managers had no subordinates reporting to them so greater emphasis was put in understanding their peer and superior relationships. The sequence of the questions was very dependent on the response of the manager. That is, it was sometimes necessary with one manager to have a lengthy discussion on his system for controlling and regulating the distant transformations before examining his interpersonal communication system with organisational members, while with another manager it could have been vice-versa. What was important for the author during the interview was to pose the necessary questions in such a way that, by the end of the interview, the information required for the models discussed in the previous chapter had been collected. This was no easy task because many managers use different names for departments, processes and documents and at times managers had to be interrupted for further clarification of sources and destinations. Most of the interviews went on for about an hour with some as long as three hours. By the end of May 1985 all the interviews in Company A had been completed and all the questionnaires received.

With Company B lengthy discussions on the study were carried out with the managing director and it was decided by him that the author should schedule the interviews rather than the organisation. This proved to be very difficult as many
managers were often away on sales visits or too busy to carry out the interview, so what should have taken a few days of interviewing time lasted over two months and the interviews were not completed until the end of July 1985. In this company sixteen managers were interviewed. The same method of administering the questionnaires and carrying out the interview in Company A was used in Company B.

Following the analysis of the Myers-Briggs Type Indicator results it was found that nearly all the cognitive styles of the managers interviewed in Companies A and B were of the Sensation-Thinking types (that is predominantly Logical types) and there was insufficient data on the operating modes of the Intuitive Types (for example NT types). It was then felt necessary to approach some other organisations in the hope of finding Intuitive types in their managerial teams. A further four organisations were approached through personal contacts to participate in the study. All four agreed during the preliminary meetings for the study to be carried out. However the method of data collecting was changed. That is, all four organisations were asked to fill in the questionnaires first and if the cognitive results proved interesting (which to the author meant that the organisation had a fair proportion of intuitive type managers) then the interviewing process would be carried out. Company C was a large communications corporation and agreed that the questionnaires should be only administered to its top managers and directors. The results of the questionnaires showed a large proportion of the managerial team were of intuitive types but during later discussions the organisation felt that the nature of the questions to be used in the interview were of too detailed a nature (and thus could be of use to competitors) and refused permission for the interviews to be carried out. The cognitive results of Company D (a large manufacturing company) and Company E (a large service and manufacturing company) showed a small proportion of intuitive types in the management teams and were thus ruled out for the interview.
process. This left Company F which was a medium sized manufacturing company and about the same size in personnel numbers and amount of sales as Company B as the only choice. Company F was structured totally differently from Company B and had a much more informal structure than Company B. Following the analysis of the cognitive results it was found that it had a good proportion of intuitive types in the management team. Interviews were carried out with sixteen managers and directors during November and December of 1985.

One of the main problems faced in the data collection was getting all the managers to carry out the interview and to respond to all of the questionnaires. This was not always possible. In some cases the manager responded to the questionnaires but was not available for the interview. In other cases the manager carried out the interview but refused to respond to the questionnaires or responded to one questionnaire and not to another. Although these managers represented a small percentage of the total sample it severely limited the analysis of their data. The main problem seems to have been the length of the questionnaires, especially the Myers-Briggs Type Indicator. In responding to this questionnaire some managers did not respond to all the questions, leaving some answers blank, and so many questionnaires were discarded. All the managers who did not respond to the questionnaires were contacted either by a follow-up visit or by phone to encourage them to respond. By doing this, over half of them responded but some just kept postponing it leading the author to believe that they did not wish to respond and were thus not contacted again.

5.3 State Two: Data Preparation

This stage only dealt with the organisational and managerial information collected through the interview process. Once data was captured on tape it had to be prepared so that it could be analysed using micro-Prolog. This involved a very
detailed and often lengthy process of data preparation. The interviews were transcribed exactly in the same way as the individual manager responded, that is word-by-word. This was quite a long and tedious process but it was felt to be very important because each specific managerial answer contained valuable information and it was necessary to have it in exactly the same form as the manager had put it across during the interview. This proved to be extremely worthwhile when it came to tracking specific points concerning how the organisation operates and the manager's method of control. Altogether some four hundred pages of transcriptions were written-up. The next step was to go through each interview and pick out pieces of information concerning managerial activities, information flows, organisational hierarchical structure etc. that are necessary for the scientific models described in the previous chapter. These pieces of information were then entered onto the data sheets (see Appendix B). Following the completion and analysis of all the interviews the information contained in all the data sheets was keyed into the BASIC Viplan Program. The amount of information entered was quite substantial and often involved some eight hours of continuous data entering. However the Viplan Basic Program was easy to use and it was found that all the information could be entered into the Organisation Data Model. Thousands of prolog statements representing important organisational transformations were thus prepared, checked and then converted using Viplan's conversion program into micro-Prolog statements (see Appendix G for examples of the prolog statements on Company B). Many of the prolog statements were computer generated. For example, the computer program would ask for the name of the managerial role and the activity performed only once while generating multiple relationships with these two bits of information without the programmer having to remember the key-words needed to link them as required by the Organisational Data Model. Using this method the programmer could always guarantee that the necessary statements are being generated and recorded.
This method of data preparation was carried out on Companies A, B and F and thus interview data in the form of transcripts was transformed into Micro-Prolog statements ready for preliminary Cybernetic analysis. Only the transcription of the tapes was lengthy and could possibly be greatly facilitated by the development of a questionnaire that could capture necessary managerial and organisational information with the same efficiency as the interview schedule but with less physical effort.

5.4 Stage Three: Data Analysis

Once the data had been collected and prepared, it became very clear that a tremendous amount of information had to be analysed. First of all there was data on the organisations that needed to be cybernetically analysed. Secondly, the data on how the managers operated, communicated, influenced policy etc needed to be examined. Thirdly, the data obtained by means of the questionnaires had to be statistically analysed, and also compared to the results obtained by carrying out a cybernetic analysis. These three sub-stages of the data analysis are reviewed below.

5.4.1 Cybernetic Analysis Of The Organisation

Once data was prepared using the Viplan front-end BASIC program, and the data converted into micro-Prolog statements, the cybernetic analysis of the organisational data began.

The first process entailed the analyst to gain an understanding of the unfolding of complexity within the system under study. Using the Technological Data Model as a model of reference, it was necessary to understand what the organisation was actually producing in terms of products or services, and to
isolate its main business areas. Once this was done, it became very important to
analyse the transcripts of the interviews to determine, from the viewpoints of the
managers, what activities the organisation was trying to make viable. This meant
looking at all the organisational entities and deciding whether they were to be
treated as primary activities or functional activities. Primary activities were
those entities or technological operations that represented units or objects of
control and which produce the missions of the organisation. The examination of
the unfolding of complexity, within the system under study, meant isolating those
primary activities at each level of complexity (such as corporate level, division
level, section level, shop level etc). This was not always so clear-cut as it seems,
for quite often very detailed analysis on operating methods and viewpoints was
necessary to determine whether an activity was a primary or a functional
activity. Functional activities were those entities or services that supported or
gave service to primary activities. For example, if a manufacturing division was
designated as a primary activity, then all the activities at the same level of
complexity that were supporting the manufacturing division in terms of sales,
accounting etc. were then treated as functional activities. However this was not
always the case, as in Company F, for some activities or entities that would
normally be seen as functional activities, such as a sales department, turned out
to be primary activities because the organisation was trying to make them
viable. No clear-cut rule was found to distinguish between the two in all cases.
Only an intuitive understanding of Beer's and Espejo's work facilitated the process
of analysis, and each case had to be treated based on a deep understanding of the
purpose of the unit, and what it appeared to be doing.

Having modelled the organisation and isolated its primary activities at
different levels of recursion, it was then necessary to examine how requisite
variety was achieved at each level of complexity or recursive level. For this kind
of analysis Beer's most recent book (Beer, 1985), which included some very useful
diagrams of the Viable System Model, and Espejo's paper on the cybernetics of a small company (Espejo, 1980) proved very useful and acted as frames of reference. At each recursive level and for each business area of the organisation, many questions were posed to the computer using the micro-Prolog programming language to see what information was flowing from one department to another. This was where Viplan proved very useful, because it facilitated the analysis of data without having to constantly refer back to the interview transcripts. The questions posed to the computer were also based on the three sub-models of the Manager-Task Interaction Model, described in an earlier chapter. Since only relevant data was entered into the Organisational Data Model using the Viplan program, it was thus possible to follow through with particular organisational transformations until it became clear what was really going on at each recursive level.

In order to determine how requisite variety was achieved at each level of complexity, a very systematic investigation was conducted. First of all it was necessary to determine all the units and individuals that were controlling particular aspects of system one, i.e. implementation, activities. Once these were isolated it was then necessary to find out who they were being regulated by (thus isolating their system three controllers) and what information was flowing between them. It became very apparent quite early on that system three was often composed of a number of managers and departments, each regulating a particular aspect of the operations. How these managers were monitoring the operations was determined from the interview transcripts and data obtained from the computer files. It was system two, i.e. coordination, activities that were often difficult to isolate, because these often were not clear to the managers themselves.

Information on the organisation's system four, i.e. intelligence, activities were obtained solely from the interview transcripts and by understanding the
purpose of many of the manager's activities. At lower levels of recursion, these activities were quite often non-existent.

Following the cybernetic analysis of Company A it became very clear that there were certain areas, such as system two and system four activities, that the analyst needed to concentrate on when posing questions to the managers in the interviews. That is, a great deal of learning was going on from case to case, so that by the time the cybernetic analysis of Company F was carried out, many points unclear in previous cases were overcome. Even when writing up the case (and presenting copies of the report to the individual companies) different approaches were used, until an adequate method of presentation was established in Company F.

The cybernetic analysis carried out in each organisation is shown in the form of case studies in Appendices H to J.

Following the analysis of Company A, it became very clear that when carrying out a cybernetic analysis on any organisation a tremendous amount of information is required to determine its cybernetics. When carrying out the interview the researcher has little idea of the cybernetics of that organisation. He is unable to handle the complexity of the information he is receiving when carrying out the interview. When posing the questions he could miss out significant areas, which become evident later when the analysis of data begins. As a way of overcoming this problem the author went back to the managers, when possible, for further clarification. When analysing Company B and F this was the strategy that was used.

5.4.2 Analysis Of How The Managers Operated

Once the cybernetics of the organisation was established, the analysis of how the managers operated began. First of all the cybernetics of the organisation
clearly established the role which the individual manager was carrying out. However, how the manager operated was found to be very much dependent on how he perceived his task. Managers as a matter of fact define their tasks by the information loops and activities to which they gave closure.

To understand how the manager operated it was necessary to examine the kind of information he was receiving, the committees he was involved in, whom he communicated with and the activities he carried out. By understanding his information loops it was possible to establish the recursive levels he was operating at, the recursive level he was monitoring at, the amount of autonomy he allowed his subordinates and the operations he perceived to be under his control.

A great deal of the information on how the manager operated was available through the Viplan data files. However further clarification on particular points was established by going back to the original interview transcripts. With respect to how the manager influenced policy, communicated, and set up guidelines, the author was totally reliant on information provided in the interview transcripts.

In the case studies each managerial position is examined, outlining the manager's role, his information loops and his method of operation.

5.4.3 Statistical Analysis Of The Questionnaires

All three questionnaires were scored manually and based on the scoring guidelines set out in their respective manuals. As previously noted, many questionnaires were discarded as they did not meet the criteria set out in the manuals with respect to the maximum number of unanswered questions not answered. However their overall percentage was very small when compared to the numbers that actually responded fully.

With respect to the Myers-Briggs Type Indicator (MBTI), the author used both the type and the continuous scores option, thus it was possible not only to
identify the manager's cognitive style but also to examine if there were any particular trends in the data.

Once the questionnaires were scored, the results were then coded and entered to data files on the university's main-frame HARRIS computer. A small program was written to analyse the data using the SPSS - Statistical Package for the Social Sciences (Nie et al, 1975). Frequencies, standard deviations, t-tests, and Pearson correlation coefficients were thus obtained for the data.

With respect to those managers that filled out the MBTI and the other two questionnaires, graphical representations of their individual scores were prepared using the IBM personal computer and the graphics option on the OPEN ACCESS software program. This was done to examine if there were any particular trends in the data. These graphs are shown in Appendix K together with tables of their individual scores on all the questionnaires. These graphs were very useful in identifying not only trends, but also those managers whose strain scores were quite high.

The statistical results obtained are reviewed below under three categories, the managerial sample, cognitive style of the manager, and strain results of the managers.

5.4.3.1 The Managerial Sample

Altogether some eighty-two managers from six different organisations participated in the study. Cybernetic analysis, using Beer's Viable System Model, was carried out on three of the six organisations. The managers from the three organisations (Company A, B and F) represented 47.6% of the total managerial sample. The total number of managers that participated in the study is shown in Table 5.1. 82% of the managers had worked with their organisations for less than fifteen years, with the mode having worked somewhere between one and five
### SIZE OF SAMPLE

<table>
<thead>
<tr>
<th>ORGANISATION</th>
<th>NUMBER OF MANAGERS</th>
<th>%AGE OF TOTAL SAMPLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>8</td>
<td>9.8</td>
</tr>
<tr>
<td>B</td>
<td>17</td>
<td>20.7</td>
</tr>
<tr>
<td>C</td>
<td>22</td>
<td>26.8</td>
</tr>
<tr>
<td>D</td>
<td>8</td>
<td>9.8</td>
</tr>
<tr>
<td>E</td>
<td>13</td>
<td>15.9</td>
</tr>
<tr>
<td>F</td>
<td>14</td>
<td>17.1</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>82</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

**Table 5.1**
years. Actual distribution for length of service is shown in Table 5.2. All the organisations that participated had annual sales in excess of ten million pounds with two organisations having sales in excess of one hundred million pounds (Companies C and E). Most of the organisations the managers worked for were involved in manufacturing products, with some involved also in services and retailing. The number of employees in the organisations ranged from seventy-five (Company A) to many thousands (Company C). With respect to the three organisations where a cybernetic study was carried out (Company A, B and F) further details can be obtained on the nature of the organisation by examining the introduction section of the case study. However it must be understood that the results in Table 5.1 represent the number of managers that participated in the study from each organisation, and do not necessarily reflect the total number of managers in the respective organisation.

5.4.3.2 Cognitive Styles Of The Managers

Table 5.3 shows the cognitive styles of the managers as determined by the Myers-Briggs Type Indicator. Altogether twelve different cognitive styles appeared in the sample (out of a possible sixteen styles). However, 65.7% of the cognitive styles were made up of three styles, these being ISTJ, ISTP and ESTJ. When taking out the extroversion-introversion (EI) scale and the judgement-perception (JP) scale; STs (sensation-thinking types) represented 69.8% of the cognitive styles, with the remaining 30.2% distributed mostly between NTs (intuitive-thinking types) and SFs (sensation-feeling types). With respect to the individual scales of the Myers-Briggs Type Indicator distribution between the two categories is shown in Table 5.5. As can be seen from the results there was a bias in the sample towards sensation types as these represented 74% of the sample. This was through no choice of the author but rather reflects what actually
### Period of Time Spent by Managers with Their Respective Organisations

<table>
<thead>
<tr>
<th>Length of Service</th>
<th>Number of Managers</th>
<th>Relative Frequency</th>
<th>Adjusted Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less Than 1 Year</td>
<td>12</td>
<td>14.6</td>
<td>20.7</td>
</tr>
<tr>
<td>1 To 5 Years</td>
<td>17</td>
<td>20.7</td>
<td>29.3</td>
</tr>
<tr>
<td>6 To 10 Years</td>
<td>10</td>
<td>12.2</td>
<td>17.2</td>
</tr>
<tr>
<td>11 To 15 Years</td>
<td>9</td>
<td>11.0</td>
<td>15.5</td>
</tr>
<tr>
<td>16 To 20 Years</td>
<td>2</td>
<td>2.4</td>
<td>3.4</td>
</tr>
<tr>
<td>Greater Than 20 Years</td>
<td>8</td>
<td>9.8</td>
<td>13.8</td>
</tr>
<tr>
<td>Unknown (Missing Data)</td>
<td>24</td>
<td>29.3</td>
<td>MISSING</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>82</strong></td>
<td><strong>100.0%</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

*Table 5.2*
<table>
<thead>
<tr>
<th>COGNITIVE STYLE</th>
<th>NUMBER MANAGERS</th>
<th>RELATIVE FREQUENCY</th>
<th>ADJUSTED FREQUENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISTJ</td>
<td>16</td>
<td>19.5</td>
<td>21.9</td>
</tr>
<tr>
<td>ISTP</td>
<td>10</td>
<td>12.2</td>
<td>13.7</td>
</tr>
<tr>
<td>ESTP</td>
<td>3</td>
<td>3.7</td>
<td>4.1</td>
</tr>
<tr>
<td>ESTJ</td>
<td>22</td>
<td>26.8</td>
<td>30.1</td>
</tr>
<tr>
<td>ISFJ</td>
<td>1</td>
<td>1.2</td>
<td>1.4</td>
</tr>
<tr>
<td>ESFP</td>
<td>1</td>
<td>1.2</td>
<td>1.4</td>
</tr>
<tr>
<td>ESFJ</td>
<td>1</td>
<td>1.2</td>
<td>1.4</td>
</tr>
<tr>
<td>INFP</td>
<td>1</td>
<td>1.2</td>
<td>1.4</td>
</tr>
<tr>
<td>INTJ</td>
<td>7</td>
<td>8.5</td>
<td>9.6</td>
</tr>
<tr>
<td>INTP</td>
<td>5</td>
<td>6.1</td>
<td>6.8</td>
</tr>
<tr>
<td>ENTP</td>
<td>1</td>
<td>1.2</td>
<td>1.4</td>
</tr>
<tr>
<td>ENTJ</td>
<td>5</td>
<td>6.1</td>
<td>6.8</td>
</tr>
<tr>
<td>(MISSING DATA - UNKNOWN)</td>
<td>9</td>
<td>11.0</td>
<td>MISSING</td>
</tr>
</tbody>
</table>

| TOTAL           | 82              | 100.0%             | 100.0%             |

*Table 5.3*
emerged. When carrying out a Pearson correlation coefficients test on the results (see Table 5.4) it was found that the sensation-intuition scale was very dependent on the organisation variable. That is, the number of sensation types or intuitive types that one actually got depended very much on which organisation was studied. In some organisations (i.e. Company A) no intuitive types appeared in the sample. It is probably quite possible to find some organisations where intuitive types represent the majority of cognitive styles. However this has to be examined. The Pearson correlation coefficients test also highlighted that there is a strong relationship between the sensation-intuition scale and the judgement-perception scale for the managers. It appears from the results that managers who are of intuitive types also rely on the perceptive mode in their approach to decision-making, while the sensation types rely on the judgement mode. However both the extroversion-introversion scale and the thinking-feeling scale were found to be independent of the sensation-intuition scale. While there was a near fifty-fifty split on the extroversion-introversion scale, with respect to the thinking-feeling scale it would appear that managers overwhelmingly rely on the thinking dimension (T) rather than the feeling dimension (F) in their approach to information evaluation. 94.5% of the managers were of the thinking mode, while only 5.5% were of the feeling mode (see Tables 5.5 and 5.6).

In examining the results it would appear that the sensation-intuition scale (SN) (which highlights mode of information gathering) is the most significant when examining managerial cognitive styles. This coupled with the thinking mode of the thinking-feeling scale gives two major types existing in organisations, the sensation-thinking type (ST) and the intuitive-thinking type (NT). While there exists other types (i.e. sensation-feeling types and intuitive-feeling types) these however represent only a small percentage of managerial types. These two types, STs and NTs, accounted for 94.4% of the total managerial styles.
### PEARSON CORRELATION COEFFICIENTS FOR THE TOTAL SAMPLE

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>EI</th>
<th>SN</th>
<th>TF</th>
<th>JP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organisation</td>
<td>.002</td>
<td>.272</td>
<td>.135</td>
<td>.043</td>
</tr>
<tr>
<td></td>
<td>P=.49</td>
<td>P=.01</td>
<td>P=.13</td>
<td>P=.36</td>
</tr>
<tr>
<td>EI</td>
<td></td>
<td>.056</td>
<td>.101</td>
<td>.148</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P=.32</td>
<td>P=.20</td>
<td>P=.11</td>
</tr>
<tr>
<td>SN</td>
<td>.056</td>
<td></td>
<td>.217</td>
<td>.362</td>
</tr>
<tr>
<td></td>
<td>P=.32</td>
<td></td>
<td>P=.03</td>
<td>P=.00</td>
</tr>
<tr>
<td>TF</td>
<td>.101</td>
<td>.217</td>
<td></td>
<td>.271</td>
</tr>
<tr>
<td></td>
<td>P=.20</td>
<td>P=.03</td>
<td></td>
<td>P=.01</td>
</tr>
<tr>
<td>JP</td>
<td>.148</td>
<td>.362</td>
<td>.271</td>
<td></td>
</tr>
<tr>
<td></td>
<td>P=.11</td>
<td>P=.00</td>
<td>P=.01</td>
<td></td>
</tr>
<tr>
<td>State Anxiety</td>
<td>.198</td>
<td>-.169</td>
<td>.006</td>
<td>-.043</td>
</tr>
<tr>
<td></td>
<td>P=.05</td>
<td>P=.08</td>
<td>P=.48</td>
<td>P=.36</td>
</tr>
<tr>
<td>Trait Anxiety</td>
<td>.231</td>
<td>-.057</td>
<td>-.123</td>
<td>-.019</td>
</tr>
<tr>
<td></td>
<td>P=.03</td>
<td>P=.32</td>
<td>P=.16</td>
<td>P=.44</td>
</tr>
<tr>
<td>Vocational Strain</td>
<td>.202</td>
<td>-.094</td>
<td>-.035</td>
<td>-.041</td>
</tr>
<tr>
<td></td>
<td>P=.05</td>
<td>P=.22</td>
<td>P=.39</td>
<td>P=.37</td>
</tr>
<tr>
<td>Psychological Strain</td>
<td>.223</td>
<td>-.061</td>
<td>.004</td>
<td>-.142</td>
</tr>
<tr>
<td></td>
<td>P=.03</td>
<td>P=.31</td>
<td>P=.49</td>
<td>P=.12</td>
</tr>
<tr>
<td>Interpersonal Strain</td>
<td>.245</td>
<td>.127</td>
<td>.166</td>
<td>-.006</td>
</tr>
<tr>
<td></td>
<td>P=.02</td>
<td>P=.15</td>
<td>P=.08</td>
<td>P=.48</td>
</tr>
<tr>
<td>Physical Strain</td>
<td>.065</td>
<td>-.014</td>
<td>.114</td>
<td>-.008</td>
</tr>
<tr>
<td></td>
<td>P=.30</td>
<td>P=.46</td>
<td>P=.17</td>
<td>P=.47</td>
</tr>
<tr>
<td>PSQ Total Score</td>
<td>.223</td>
<td>-.015</td>
<td>.078</td>
<td>-.066</td>
</tr>
<tr>
<td></td>
<td>P=.03</td>
<td>P=.45</td>
<td>P=.26</td>
<td>P=.29</td>
</tr>
</tbody>
</table>

**Legend:**
- **EI**: Extroversion-Introversion Continuous Score
- **SN**: Sensation-Intuition Continuous Score
- **TF**: Thinking-Feeling Continuous Score
- **JP**: Judgement-Perception Continuous Score
- **TYPE**: Cognitive Style as Determined by the Myers-Briggs Type Indicator
- **PSQ**: Personal Strain Questionnaire

**Table 5.4**

87
<table>
<thead>
<tr>
<th>Scale</th>
<th>Number of Managers</th>
<th>Relative Frequency</th>
<th>Adjusted Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extroversion-Introversion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extroversion</td>
<td>34</td>
<td>41.5</td>
<td>46.6</td>
</tr>
<tr>
<td>Introversion</td>
<td>39</td>
<td>47.6</td>
<td>53.4</td>
</tr>
<tr>
<td>(Unknown - Missing Data)</td>
<td>9</td>
<td>11.0</td>
<td>Missing</td>
</tr>
<tr>
<td>Sensation-Intuition</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensation</td>
<td>54</td>
<td>65.9</td>
<td>74.0</td>
</tr>
<tr>
<td>Intuition</td>
<td>19</td>
<td>23.2</td>
<td>26.0</td>
</tr>
<tr>
<td>(Unknown - Missing Data)</td>
<td>9</td>
<td>11.0</td>
<td>Missing</td>
</tr>
<tr>
<td>Thinking-Feeling</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thinking</td>
<td>69</td>
<td>84.1</td>
<td>94.5</td>
</tr>
<tr>
<td>Feeling</td>
<td>4</td>
<td>4.9</td>
<td>5.5</td>
</tr>
<tr>
<td>(Unknown - Missing Data)</td>
<td>9</td>
<td>11.0</td>
<td>Missing</td>
</tr>
<tr>
<td>Judgement-Perception</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Judgement</td>
<td>52</td>
<td>63.4</td>
<td>71.2</td>
</tr>
<tr>
<td>Perception</td>
<td>21</td>
<td>25.6</td>
<td>28.8</td>
</tr>
<tr>
<td>(Unknown - Missing Data)</td>
<td>9</td>
<td>11.0</td>
<td>Missing</td>
</tr>
<tr>
<td>Total on each scale</td>
<td>82</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Table 5.5
MEANS AND STANDARD DEVIATIONS FOR THE MYERS-BRIGGS TYPE INDICATOR USING CONTINUOUS SCORES OPTION

<table>
<thead>
<tr>
<th>Scale</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extroversion-Introversion</td>
<td>102.1</td>
<td>21.0</td>
</tr>
<tr>
<td>Sensation-Intuition</td>
<td>82.9</td>
<td>26.2</td>
</tr>
<tr>
<td>Thinking-Feeling</td>
<td>70.2</td>
<td>19.5</td>
</tr>
<tr>
<td>Judgement-Perception</td>
<td>86.3</td>
<td>23.9</td>
</tr>
</tbody>
</table>

Table 5.6
5.4.3.3 Strain Results Of The Managers

With reference to Table 5.7, the mean strain and anxiety scores for the total sample were slightly lower than those shown for working populations in the questionnaire manuals. Spielberger reports in the State-Trait Anxiety Inventory (STAI) manual that the anxiety means and standard deviations based on a sample of 1,387 male working adults were:

<table>
<thead>
<tr>
<th></th>
<th>S-Anxiety</th>
<th>T-Anxiety</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>35.72</td>
<td>34.89</td>
</tr>
<tr>
<td>SD</td>
<td>10.40</td>
<td>9.19</td>
</tr>
</tbody>
</table>

This was quite surprising, because the review of the stress/strain literature appeared to show that managers worked in somewhat stressful occupations, and were thus expected to have higher anxiety/strain scores than the average working adults. While it is clearly understood that the author's sample is rather small, it nevertheless represented a number of different organisations and managers from different structural levels.

When the author decided to use the Personal Strain Questionnaire (PSQ) it was clearly understood that it was a relatively new questionnaire and there were few validity studies on it. However the nature of the questions appeared to be suitable for the kind of study that was being undertaken, and was thus adopted. It was extremely important right from the beginning that the PSQ results needed to be correlated with the STAI, to identify whether both questionnaires were measuring the same kind of variables.

With reference to Table 5.8 showing Pearson correlation coefficients for the two questionnaires the results appear to show that trait anxiety is very highly linked with psychological strain. However, vocational strain and state anxiety, although both highly correlated with psychological strain, are not alone sufficient
MEANS AND STANDARD DEVIATIONS FOR ANXIETY AND STRAIN QUESTIONNAIRES FOR THE TOTAL SAMPLE

<table>
<thead>
<tr>
<th>QUESTIONNAIRE AND SCALE</th>
<th>MEAN</th>
<th>STANDARD DEVIATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>STATE-TRAIT ANXIETY INVENTORY</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S-Anxiety Scale (Form Y-1)</td>
<td>32.2</td>
<td>6.7</td>
</tr>
<tr>
<td>T-Anxiety Scale (Form Y-2)</td>
<td>33.5</td>
<td>6.4</td>
</tr>
<tr>
<td><strong>PERSONAL STRAIN QUESTIONNAIRE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vocational Strain</td>
<td>16.2</td>
<td>3.6</td>
</tr>
<tr>
<td>Psychological Strain</td>
<td>17.1</td>
<td>4.9</td>
</tr>
<tr>
<td>Interpersonal Strain</td>
<td>16.5</td>
<td>3.9</td>
</tr>
<tr>
<td>Physical Strain</td>
<td>16.6</td>
<td>4.8</td>
</tr>
<tr>
<td><strong>TOTAL SCORE</strong></td>
<td>66.46</td>
<td>14.0</td>
</tr>
</tbody>
</table>

TOTAL NUMBER OF MANAGERS RESPONDING TO QUESTIONNAIRES

<table>
<thead>
<tr>
<th>STATE-TRAIT ANXIETY INVENTORY</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>S-Anxiety Scale (Form Y-1)</td>
<td>80</td>
</tr>
<tr>
<td>T-Anxiety Scale (Form Y-2)</td>
<td>77</td>
</tr>
<tr>
<td><strong>PERSONAL STRAIN QUESTIONNAIRES</strong></td>
<td>78</td>
</tr>
</tbody>
</table>

Table 5.7
PEARSON CORRELATION COEFFICIENTS FOR THE ANXIETY AND STRAIN QUESTIONNAIRES

<table>
<thead>
<tr>
<th>Instrument</th>
<th>S-Anxiety</th>
<th>T-Anxiety</th>
<th>Vocational Strain</th>
<th>Psychological Strain</th>
<th>Interpersonal Strain</th>
<th>Physical Strain</th>
<th>PSQ Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-Anxiety</td>
<td>0.681</td>
<td>0.569</td>
<td>0.688</td>
<td>0.446</td>
<td>0.574</td>
<td>0.70</td>
<td></td>
</tr>
<tr>
<td></td>
<td>P = .00</td>
<td>P = .00</td>
<td>P = .00</td>
<td>P = .00</td>
<td>P = .00</td>
<td>P = .00</td>
<td></td>
</tr>
<tr>
<td>T-Anxiety</td>
<td>0.596</td>
<td>0.730</td>
<td>0.548</td>
<td>0.633</td>
<td>0.781</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>P = .00</td>
<td>P = .00</td>
<td>P = .00</td>
<td>P = .00</td>
<td>P = .00</td>
<td>P = .00</td>
<td></td>
</tr>
<tr>
<td>Vocational Strain</td>
<td>0.584</td>
<td>0.401</td>
<td>0.400</td>
<td>0.714</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>P = .00</td>
<td>P = .00</td>
<td>P = .00</td>
<td>P = .00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psychological Strain</td>
<td>0.556</td>
<td>0.638</td>
<td></td>
<td></td>
<td>0.877</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>P = .00</td>
<td>P = .00</td>
<td></td>
<td></td>
<td>P = .00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interpersonal Strain</td>
<td>0.591</td>
<td>0.703</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.837</td>
</tr>
<tr>
<td></td>
<td>P = .00</td>
<td>P = .00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>P = .00</td>
</tr>
</tbody>
</table>

Table 5.0
to account for it. That is to say whatever the stresses of the job, psychological strain does not necessarily follow. Vocational strain does not appear to be correlated with any of the other variables except with the PSQ total score. Although all the correlations are highly significant ($p \leq .001$), they are nevertheless, with the exception of the PSQ score, relatively low. The factor which is most implicated in psychological strain is trait anxiety (correlation = .73), which seems to indicate that psychological strain is a matter of dispositional reactions to environmental stress, which really means that some individual managers are better able to cope with the strain of their jobs or tasks than others.

An examination was made to see if there was any relationship between cognitive style and strain/anxiety for the sample. Pearson correlation coefficients were calculated to test this (see results in Table 5.4). Although the correlations for the extroversion-introversion scale (EI) are highly significant ($p \leq .05$), they are nevertheless very low. The Pearson correlation coefficient results appear to show that there is no significant relationship between the cognitive style variable and the various scales on both the strain and the anxiety questionnaires. T-tests were also carried out to test this relationship and appear to show that the extroversion-introversion scale is significant when examining trait anxiety and interpersonal strain, as significant levels appear quite high as $p \leq .05$ (see Tables 5.9 to 5.11). However when looking at the means for both the extroverted and the introverted managers on these scales it was found that introverted managers were only slightly more strained than extroverted managers. The overall conclusion based on the two types of tests carried out would appear to show that cognitive style has little or no effect on strain/anxiety levels or scores for the sample.

However, when taking the individual scores of the managers on each scale and relating them to the structural position the manager holds, coupled with an understanding of the task of his concern and his cognitive style, the results seem
<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>NUMBER OF MANAGERS</th>
<th>MEAN</th>
<th>STANDARD DEVIATION</th>
<th>T-VALUE</th>
<th>PROBABILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extroversion-Introversion Continuous Score</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensation</td>
<td>54</td>
<td>101.0</td>
<td>21.2</td>
<td>-0.73</td>
<td>0.468</td>
</tr>
<tr>
<td>Intuition</td>
<td>19</td>
<td>105.1</td>
<td>20.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thinking-Feeling Continuous Score</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensation</td>
<td>54</td>
<td>67.6</td>
<td>20.3</td>
<td>-2.33</td>
<td>0.025</td>
</tr>
<tr>
<td>Intuition</td>
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Table 5.11
to point to an interesting relationship. That is, to understand why a particular manager has a high strain or anxiety score, a fundamental understanding of his structural position and how he perceives his task must first be undertaken. First the individual results, shown in graphical representations in Appendix K, seem to indicate that nearly every manager suffers from strain/anxiety, even if it is not excessive strain (calculated by taking the difference between the state and trait score while at the same time examining the individual scores on the Personal Strain Questionnaire), in some form or another.

For example, one manager might have high psychological strain, while another might have high interpersonal strain. These individual scores can be explained if sufficient knowledge exists about how that manager is operating. When the graphs were produced and scores calculated, they were reviewed with their respective managers to help explain why their scores were high on certain scales. For example the Group Training Manager of Company F was asked why he had a high interpersonal strain score. His reply was that he was still relatively new to the job and was finding it a strain to establish his communication channels with his superiors and to negotiate adequate resources necessary to carry out his job. The maintenance manager in Company F was asked why he had high vocational and psychological strain scores. His reply was that his job was very routine and gave him no chance to be creative. This was no surprise because this manager was an intuitive type (NT) and was placed in a role that would probably be more suitable for a logical type (ST).

So what do the above results tell us in terms of the fit between the individual and what is required of him in an organisation. The results seem to indicate when examined on a case by case basis, even though it is not possible to conclude outright, that managers face strain as a result of their relevant organisations not being effective i.e. not following the principles of viability. Managers constantly have to fight for adequate resources, autonomy to carry out
their operations, to establish effective communication channels, and many other factors. These factors are important and necessary for them to carry out their activities and to manage the tasks of their concern. They perceive some kind of strain (the particular type of strain they will face is dependent on the kind of problem they are facing at a particular point in time) when they feel that the cybernetics of their organisation is limiting their ability to attain their needs. If the organisation was structured in a viable manner, each role would be provided with the necessary resources, the communication channels necessary to inform and to be informed, the autonomy to manage and so on. This would be expected to reduce considerably many forms of strain currently faced by managers. Secondly it is possible to hypothesize that both vocational and psychological strain can be minimized by matching particular types of managers to specific positions. Even though it is the manager that shapes and develops the task, the organisation by means of its expectations and assigning a role to that manager can influence, to some extent, the underlying nature of that task. Some cognitive styles, such as STs, appear to fit well with tasks that require constant day-to-day administration, such as a production department or an accounting department, while others, such as NTs, seem to fit better with tasks that require of the manager to be very creative and to distance himself from the operational details, such as developmental work.
CHAPTER SIX

DISCUSSION OF EMPIRICAL RESULTS

6.1 Introduction

In this chapter the author seeks to review the overall results of the study. The results reviewed are those which had been obtained by carrying out the three case studies and the statistical results on cognitive styles and strain/anxiety. Once the overall results are reviewed, the author sets about highlighting some of the implications of the findings.

6.2 How The Managers Operated

The managers that participated in the study carried out numerous activities with respect to their tasks. In fact by simply observing them one would conclude that no two managers carry out the same activities. However this is very much at the surface level. What tasks they carry out and why, can be understood and put into perspective by carrying out a cybernetic analysis. It then becomes quite apparent that the numerous activities they do carry out, are actually related to the regulation of particular organisational operations, to facilitate the overall process of regulation. This seems to support Beer's conceptualisation of management, that management is the profession of regulation. However what must be understood is that, too often the regulation of a particular operation or a business unit does not rely solely on one manager, but the combined efforts of a number of managers and staff, each regulating a particular aspect of it. It is this aspect and that of communication between the individuals in an organisation, that binds the organisation together. The manager's performance and that of the unit
he is controlling is very much dependent on the performance of others. Using Beer's Viable System Model gives meaning and appreciation to what the manager is actually carrying out. Even to the extent of highlighting neglected areas that the manager should be controlling and monitoring, based on the cybernetics of his organisation and cybernetic laws of viability that lie at the heart of any enterprise.

The manager was often perceived by his superiors and peers to be responsible for a particular unit or operation. This unit can be a whole group of companies or it could be a small assembly operation. It is this perception and the expectations that inevitably arise from it that define the role of the manager in a particular organisation. It also establishes the fundamental nature of the problems that he is expected to handle. When things go wrong or not according to the expectations, the members of the organisation cognitively recognise whose problem area it is and expect the manager to handle it. This role is not fixed, it changes with time as expectations change and as new problems are encountered. Once a particular problem area is associated with an individual manager, the only way a manager can distance himself from it is to let the other managers know that he no longer gives closure to its information loops. As long as the manager gives closure to particular problems and information loops, he inevitably continues to reinforce particular aspects of his role.

The manager strives for homeostasis with respect to his task and with respect to his organisational role. If the manager perceives that his organisation has changed its direction or changed its strategy with respect to a particular area, then cognitively his perception towards his task will change. This comes about as a result of the manager facing cognitive strain, resulting from his perception that his perceived criteria of stability is no longer applicable. The manager then acts to change his criteria of stability with respect to the task of his concern, and to bring his unit's performance in line with the organisation's expectations. To what
extent he is successful in overcoming this strain is dependent on a number of factors (e.g. the strategy he uses or the cybernetics of his organisation).

While the expectations that other members have of a particular manager define the role of the manager, this in no way defines the task for the manager. At times the role of the manager (such as managing director or production director) had no resemblance to what the manager was actually regulating. In Company B the managing director was actually carrying out the role of the installation manager, and the production manager of Company F was only regulating one aspect of production, inspection and packaging, and not the whole of production. The manager defined his task by the series of activities he carried out and involved himself in, and by giving closure to particular organisational transformations. Clearly the managing director of Company B saw his task as one to get involved in the operational aspects of the installation activity and not to manage and monitor the activities of the major divisions, even though his role was clearly established within the company as being the latter.

It was the initial purpose of this study to examine the various strategies used by managers to handle the complexities implied by their tasks. It was perceived by the author very early on that cognitive style might have an effect on these strategies. This hypothesis was confirmed with respect to the sample. It was shown in Chapter Five that there existed two major cognitive styles in the six organisations where the managers were tested. These two styles, sensation-thinking and intuitive-thinking, accounted for 94.4% of the sample. These two styles represented two differing approaches, quite often polar opposites, in variety engineering.

The first style of managers, sensation-thinking (ST), which will be referred to as the logical style, quite often saw their tasks (in terms of activities and operations) as being very much fixed. That is to say they had a very much fixed view of homeostasis. They clearly set boundaries
on their tasks and set out criteria of stability which they sought to maintain. They perceived little change with respect to their working environments and quite often strived to maintain their particular working modes or method of operation. The logical types perceived that control of the task is better achieved by getting closer to the actual operations, and thus were often found to operate at the implementation level. That is, logical types attempted to shorten the communication lines between them and the actual technological operations. In so doing they collapsed their role, to operate at a lower recursion level. An example of this process is when a managing director collapses his role to take on the role of his production manager. In Company A the managing director, a logical type, collapsed his role to that of his production manager, forcing this manager to take on a materials management role. Quite often when the subordinate manager has had his role taken over, and he himself is a logical type, he will then attempt to collapse his role to take over the role of his subordinate. So what happens in some organisation structures is a cascading effect. Given that there is a limit to this cascading effect, what inevitably happens in some organisations is a reduction in the levels of hierarchy, thus bringing senior directors and managers into areas of operational control that they should not be managing. An example of this is the management of the two plant's technological operations in Company F. The exception to this rule, and where the structure of the system becomes extremely important, are those managers who operate in a staff position or who are in control of a support unit, such as an accounting department or a sales department, and who quite often did not have subordinate managers. These managers collapse their role to the extent that they carry out physically the implementation of the task themselves. So that a sales manager takes on the salesman role, and the financial director carries out the bookkeeping function himself, instead of attempting to regulate the activities of the personnel and the department of their concern.
The aspect of involvement in the operational details severely limited the capacity of the logical type managers to think about system four, intelligence, activities. In fact when interviewing the logical types, they constantly stressed the fact that their job was to deal with what was happening at that moment, and that they had little time to think about where the company was heading or what the company should be doing a year later. Planning for the logical type managers was in terms of short term, usually less than three months.

In most cases it was found that logical type managers severely limited the autonomy of their subordinate managers. If we were to agree that managers should have the objective to make the policies of a system viable, by giving discretion to sub-systems to carry out particular areas of policy, then surely logical type managers are restricting the autonomy of their subordinates. In so doing they limit the viability of the system that they are trying to control.

Logical type managers seemed to have a greater need for details on operational aspects than other types. Having recognised this after a number of interviews, the author sought from one manager the answer to why he was collapsing his role and limiting the autonomy of his subordinates. His reply was:

"I can control it much better that way and point the managers where they are going wrong and teach them where they should be looking, rather than relying on them.... I get the picture, and not the picture people want to present to me. I think if you are dealing with one set of people they get used to you. It’s a picture that they see of what’s going on on the shopfloor, and unless you go and talk to the people on the shopfloor, and get to talk to the people who work for the managers, you can get different aspects arising. You can get a broader picture. You have to be careful about which picture is coming across and what to do about it."

This statement for the author implies two important points. The first is that logical type managers perceive a great need to monitor. That is they attempt to validate the reports that they are receiving from their subordinate managers by talking to their subordinate's subordinates. However the extent of their monitoring is such that it is not sporadic but rather continuous, to such an extent that a collapsing effect emerges. The second is that logical type managers appear:
not to accept other viewpoints concerning the state of the situation. Stafford Beer's model, the author believes, is built on the acceptance of other viewpoints while at the same time monitoring to determine if that viewpoint is a reflection of what is really going on. The author would thus argue that the fundamental strategies used by logical managers, in handling the complexity of their situation, is in conflict with Stafford Beer's democratic notion and acceptance of other people's viewpoint (that is implied by the structure of his model).

The second style of managers, intuition-thinking (NT), which will be referred to as the intuitive style, quite often saw their tasks as ones of constant change. Their criteria of stability was constantly modified, changed as deemed necessary to bring it in line with the operational environment they were operating in. That is, their mental models of their situation appeared very flexible. They did not appear to impose their models on the situation but rather allowed them to be modified by the circumstances of the situation they were tackling at a particular point in time. Evidence of this was in the way they were coordinating particular operations. The logical types quite often set very clear guidelines and rules to coordinate activities, while the intuitive types quite often used committee discussions to handle the coordination of activities. In these committee discussions they made their decisions based on a case by case approach. The intuitive types also perceived that control of the task is better achieved by distancing themselves away from the actual operations. That is, intuitive types maintained the communication lines and did not shorten them by collapsing their roles. They gave adequate autonomy to their subordinates to carry out their function. Typical of the operating mode of the intuitive type is the technical director of Company F who gave sufficient autonomy to his maintenance and safety managers to carry out their activities, with as little interference as possible, while at the same time monitoring their performance, even though not very effectively. Intuitive types wanted to distance themselves
from the people actually implementing the activities or operations. The number and type of reports that intuitive types required were few and far less detailed, and their concentration was on trends rather than raw statistical data (commonly attributed to the needs of the logical type managers).

By distancing themselves away from the implementation of the operations, intuitive types had greater amount of time to concentrate on system four, intelligence, activities. They appeared to be exploring new ideas, new technologies and new strategies to cope with the constantly changing state of the environment. They saw the possibility of planning for the long-term, usually one to five years, and appeared to enjoy working on aspects where the rules were not sharp and not so clear-cut.

The investigation carried out in the three companies confirmed that managers work in a situation where there are no clear or well defined objectives. Managers need to interact with other members of the organisation to help them recognise what needs to be carried out. It is through interpersonal contacts and cooperation with other members that the manager gathered his information, worked out his ideas, got a feel for the other members' concerns, and clarified at least on the short term what he needed to do. It is through these interactions that the manager gained an understanding of what was going well and what problems existed, in real time. The manager gained through the interactions an understanding of the relevant courses of action and the other members' direction in solving particular problems, and facilitated the process of putting across his ideas and seeing how others react to them. The manager also used these interactions to amplify his ideas by stimulating, creating interest, and getting the support of his peers and superiors. Managers communicated with other members to facilitate the carrying out of their task. In so doing they quite often cut across formal communication lines.

Managers, when attempting to communicate with staff or shopfloor
personnel not under their control, always approached the manager in charge of the unit or sub-unit before directly approaching that manager's subordinates. When there was a conflict of direction for the subordinate, the manager withdrew his directive to discuss the situation with that subordinate's superior. This was done for two reasons. The first reason is that managers quite often did not understand the full complexity of the unit they approached, it was to them a black box. In approaching the unit their aim was to effect a change in that unit's output and not to interfere in the method by which it produces that output. If they perceived their interference would drastically affect the regulation of that unit then support must first be obtained from the unit's manager (whom, he assumed, fully understood the complexity of the situation) so as to minimise the disturbances. The second reason was because managers did not want to undermine the authority or directives of the unit's manager to ensure future cooperation.

6.3 Implications Of The Findings

In dealing with the Implications of the findings, the author in this section of the study is going to tackle the analysis from the perspective of two viewpoints. The first is the implication of the findings to the users, in this case the three organisations that received reports on the cybernetics of their organisations. The second is the implication of the findings with respect to the theory of managers and management in general.

The power of the model that was used both to collect the data and analyse it, can best be exemplified by the reaction of the managers who received a report on the cybernetics of their organisation. The findings seemed to support their intuitive understanding of their organisation, while highlighting to them the underlying reasons why certain problems occurred. Their initial surprise was the fact that the report accurately reflected what was going on, while at the same
time highlighting the mechanisms that were in operation. Some managers, who had worked for their organisations for many years, recognised that particular problems occurred, but could not understand why they did. It was partly by reading the report that they began to understand why. Many of the recommendations produced in the reports were subsequently adopted. This fact should not be dismissed lightly, for it implies that Beer's viable system model not only gives the researcher an accurate and valid measure for the study of organisations, but that the results achieved could well be adopted to affect a change in those very organisations.

With respect to the implications of the findings for the theory of managers and management there are three major points. The first, if the results can be further substantiated by future researchers in this area, is the importance of recognising that cognitive style is a major and important variable when attempting to study the strategies used by managers in handling variety. This variable is too often ignored by researchers.

The second point is that normative recommendations can be made for the effective placement of individual managers in an organisation if adequate information is provided on the cybernetics of the organisation and the cognitive style of the manager. The evidence seems to support that some cognitive styles are more effective in particular structural positions than others.

The third point is that Beer's model of the viable system, coupled with some of the tools described in earlier chapters, offers a valuable framework for the study of not only how organisations operate, but also at the micro level how the managers themselves operate. This is extremely important because management research, the author believes, lacks such a framework. A framework that can handle the complexity that is implied by the managerial situation at both the abstract and concrete levels, while at the same time offering a valuable alternative and structure that can both improve the effectiveness of the organisation and the managers contained within it.
CHAPTER SEVEN

CONCLUSIONS OF THE STUDY

This study set out to investigate empirically the interaction "manager-task" using a human information processing approach. Specifically it focused on trying to understand how managers handle the complexity implied by the tasks of their concern. In short its focus was in trying to isolate the various strategies used by managers when operating in their organisations. A literature review was carried out to shed light on this area of study. The literature review revealed, that researchers lacked a strong framework to analyse the area of how managers operate adequately, that researchers often ignored the cognitive style variable in their analysis, and that a new approach was required to handle the complexities of the area under study comprehensively. The basis for the new approach was found in the numerous works of two notable management cyberneticians, Stafford Beer and Raul Espejo, and specifically in their work on the Viable System Model.

A model was created to bring together many ideas from a number of authors, and which relied to a considerable extent on Stafford Beer's conceptualisation of management (that management is the profession of regulation). The model highlighted the need to look at the manager's interpersonal communication system, the manager's system for controlling and regulating distant transformations, and the manager's system for receiving information on and monitoring of the distant transformations. It also highlighted the need to examine the effect cognitive style has on the three above systems, and to examine the manager's fit within the organisation. As a method to examine the manager's three systems, a number of tools and instruments were developed to analyse the manager's method of operation. A computer program based on the work of Raul Espejo in the area of viability planning, was written to make feasible the analysis of organisational data. Carl Jung's theory of psychological types formed the basis

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of the method to examine the manager's cognitive style. Specifically, the Myers-
Briggs Type Indicator was used as a questionnaire to implement his theory of
types. As a method to examine the manager's fit within an organisation, it was
decided to use two anxiety/strain instruments, the State-Trait Anxiety Inventory
and the Personal Strain Questionnaire as a way of gaining from the manager's
point of view his "fit" within the organisation.

Many organisations in the area of the West Midlands (England) were
approached for permission to carry out empirical research and to test the model.
Altogether six organisations decided to participate. Of the six in only three a full
cybernetic analysis was carried out and their managers interviewed. The other
three agreed only to participate in the response to the questionnaires on cognitive
style and anxiety/strain. Altogether some eighty-two managers participated in
one form or another in the study. Data on the organisations and the managers was
analysed using a variety of methods. The results obtained point to the following
general conclusions.

(1) Stafford Beer's conceptualisation of management and his Viable
System Model offer a powerful framework for the study of
organisations and the manager-task Interaction. Beer's Viable System
Model gives meaning and appreciation to what the manager is actually
carrying out.

(2) Cognitive style appears to be an important variable when analysing
the strategies used by managers, in handling the complexity implied
by the tasks of their concern.

(3) The manager's task is not independent of the manager, but rather it is
the manager who defines the task. The manager does this by the
series of activities he carries out, and the activities he gets involved in, and by giving closure to particular organisational transformations.

(4) It is possible to make normative recommendations concerning the structural placement of individual managers in an organisation, if sufficient knowledge exists concerning the cybernetics of that organisation and the cognitive style of the manager.

(5) Many forms of managerial cognitive strain can be explained by the lack of fit between the manager's operating mode and needs, and the structural position (in cybernetic terms) he is operating in.

The results also appear to show the following specific conclusions:

(1) It is the perception and the expectations of other organisational members that define the role of a manager in a particular organisation. This role is not fixed. It changes with time, as expectations change and as new problems are encountered. As long as the manager gives closure to particular problems and information loops, he inevitably continues to reinforce particular aspects of his role.

(2) Managers work in a situation where there are no clear or well defined objectives.

(3) It is through interpersonal contacts and cooperation with other members that the manager gathered his information, worked out his ideas, got a feel for the other member's concerns, and clarified at
least on the short term what he needed to do. The manager uses these interactions to amplify his ideas, by stimulating, creating interest, and getting the support of his peers and superiors.

(4) Two managerial styles (as defined by the Myers-Briggs Type Indicator) Sensation-Thinking and Intuitive-Thinking appear to represent the majority of cognitive styles in organisations. These two styles represented two different approaches, quite often polar opposites, to organisational variety engineering.
CHAPTER EIGHT

RECOMMENDATIONS FOR FUTURE WORK

There are five recommendations that can be made to other management scholars wishing to undertake similar research. These recommendations are based on an understanding of what has been carried out and on some of the perceived weaknesses of the study. They are put forward in the hope that other researchers will want to research further aspects of the research done by the author.

(a) The Myers-Briggs Type Indicator was found to be an effective instrument in determining the cognitive style of managers, moreover there is a substantial body of literature centered around this instrument. Further research using this instrument should help to add to the corpus of theory on the cognitive style of managers.

(b) The findings of this research study show that there is a dominance of two cognitive styles, sensation-thinking and intuitive-thinking, in business organisations. However, further research in this area is needed to substantiate these findings. If these findings are confirmed then greater efforts would be necessary in the understanding of only these two styles.

(c) The framework that has been used in this study, which relies to a considerable extent on Stafford Beer's Viable System Model (VSM), was found to be powerful and effective to study the interaction "manager-task". Effective from the standpoint that it enables the researcher to examine in some detail the managerial situation at multiple recursive levels in an organisation. Powerful in that it enables the study of a particular manager within his immediate organisational environment, while at the same time it also enables the researcher to examine the effect of the manager's actions on his peers and subordinates. Indeed, the VSM also allows for appreciation of the actions of an individual.
manager within the organisational context, because unlike many models commonly
found in the management literature, the VSM allows the analysis of individual
actions without losing sight of the overall mechanisms of adaptation and control
of the whole organisation. If anything the three case studies enforce the
importance of the individual manager, and highlight the actions and strategies
used by managers with respect to the future viability of their organisation.
However, the conclusions regarding the operating modes of managers in an
organisation need to be substantiated by further research in this area.

(d) A better measure of "fit" is needed than the one used in this study.
The use of anxiety/strain instruments to capture how a particular manager
perceives his fit in his organisation is one way, but it would be better to have a
new measure that is independent of the perceptions of the manager. Such a new
measure could possibly look at measuring how the manager's actions, with respect
to his task(s), contribute to the overall viability of the organisation.

(e) The above recommendation depends to a larger extent on the
measurement of complexity. Greater efforts are required to develop instruments
than can make feasible the collection of organisational and managerial data. With
the increasing availability of micro-computers and fifth generation computer
software, capable of handling large amounts of data, this kind of measurement
becomes a real possibility. It would seem necessary for future scholars to develop
computer programs that not only capture the necessary data but also analyse it in
an expert fashion.
APPENDIX A
MANAGER-TASK ANALYSIS INSTRUMENT
MANAGER-TASK ANALYSIS INSTRUMENT

INTERVIEW SCHEDULE

PREPARED AT THE UNIVERSITY OF ASTON IN BIRMINGHAM

INFORMATION MANAGEMENT DIVISION MANAGEMENT CENTRE

MARCH 1985
INTRODUCTION

This "Interview Schedule" is divided into two sections. The first section consists of questions to ask the interviewee with the specific objective of gathering data to capture the way a manager perceives his/her job. The questions are listed under three different parts. These are:

Part One ..... The manager's interpersonal interactions with organisational members and others.
Part Two ..... The manager's system for controlling and regulating the distant transformations.
Part Three ..... The manager's systems for receiving information on and monitoring of the distant transformations.

Each area has specific questions that tackle the capturing of data for its own particular system.

The second section has been designed with the specific purpose of facilitating the process of recording and analysing the data for the researcher. Each system area answer is recorded in its allocated space enabling the researcher quick and easy access to relevant data without him/her having to go back to the interview notes.
SECTION ONE

QUESTIONS TO ASK INTERVIEWEE

PART ONE ..... MANAGER'S INTERPERSONAL COMMUNICATION SYSTEM WITH ORGANISATIONAL MEMBERS AND CUSTOMERS

(1) Who do you see, both within this organisation and external to it, as being in your view fundamental to your job in helping to understand what is it that is required of you, and as to what needs to be carried out in your particular entity?

Answer = Establishing from the manager's perspective who are the relevant people and who is in his immediate sphere of interactions.

(2) How do you influence or communicate with your superior? For example, do you approach him personally or by exerting some kind of group pressure on him? What exactly is the method you use to communicate with him?

Answer = "Superior". Establishing the manager's communication system or interpersonal interaction with his superior(s).

(3) How extensive is the relationship that you have with your peer(s) and how do you go about influencing them or getting them to carry out particular actions that are necessary for the efficient and effective development of your entity?

Answer = "Peer(s)". Establishing the extent of the manager's interpersonal interactions with his peers and their subordinates and the communication system that he has established with them.
(4) For those persons who are the recipients of or benefit from the work that you carry out, what is the method they use to influence the way you carry out your work and what method do you use to communicate with them? How do you go about recognizing if they are satisfied with the product/service that you have produced?

Answer = "Beneficiary". Establishing the manager's interpersonal interactions and communication system with the beneficiaries of his transformation process.

(5) How do you go about interacting with the suppliers? What system have you established in communicating with them, and what method do they use in influencing the way you carry out your activities?

Answer = "Supplier". Establishing the manager's interpersonal interactions with the suppliers and what communication system he uses to communicate with them.
PART TWO ..... THE MANAGER'S SYSTEM FOR CONTROLLING AND REGULATING THE DISTANT TRANSFORMATIONS

(1) How do you keep control over the activities that you are responsible for? Do you think that you maintain adequate control of your personnel and resources?

Answer = Establishing the manager's perception of his control relationship vis-a-vis his entity.

(2) How do you negotiate the allocation of resources to the personnel that you are responsible for? Is there some kind of overall organisational plan that guides you or is it something that you have worked out by yourself?

Answer = "Control & Regulation System". The manager establishes the method he uses in establishing guidelines that control and regulate the distant transformations.

(3) To what extent do you take into consideration the views of other organisational members such as your peers and superiors when drawing up rules and procedures? And to what extent are your subordinates involved in this process?

Answer = "Role". Establishing the extent of involvement by external members (peers and superiors) in shaping the way the manager controls and regulates his system.
(4) What method do you use in conveying guidelines, rules and procedures to your subordinates. For example is it done by memos or at the weekly departmental meeting? Can you please clarify.

Answer = Establishing the manager's system for conveying control procedures and the communication system he is using.
PART THREE .....THE MANAGER'S SYSTEM FOR RECEIVING INFORMATION ON AND MONITORING OF THE DISTANT TRANSFORMATIONS

(1) With reference to the activities that you are responsible for, what reports do you receive on them and what information value do you obtain from them to enable you to recognize the level of performance that is being carried out in these activities?

Answer = "Reports". Manager defines the nature of the reports he receives.

(2) How often do you receive these reports, from where do they originate and by what method are they communicated to you?

Answer = "Reporting Procedure Or Information System". Manager defines the reporting procedure and information system he is using.

(3) Are these reports concerned with a particular activity or a number of activities? Can you clarify which activities do these reports concern?

Answer = "Distant Transformations". Manager defines the distant transformations that the reporting procedure is providing information on.

(4) How do you know, that the reports are a true reflection of what is really going on? Are there particular methods or procedures that you have adopted to validate the information that is contained in the reports?

Answer = "Monitoring System". Manager defines his method of validating the reports and thus leading to a further discussion of his monitoring loop.
APPENDIX B

VIPLAN DATA SHEETS
SECTION: TO CREATE ORGANISATIONAL ENTITY HIERARCHY

[1] NAME OF ORGANISATION

[2] NAME OF ORGANISATIONAL ENTITY

[3] ORGANISATIONAL ENTITY LEVEL

[4] ORGANISATIONAL ENTITY HAS MAIN ROLE

[5] ORGANISATIONAL ENTITIES BELONGING TO IT

ARE THERE ANY MORE ENTITIES YES/NO
If Yes Continue Onto Next Sheet.
NAME OF ORGANISATIONAL ENTITY

org-entity   code

has

org-entity   code

org-entity   code

org-entity   code

org-entity   code

org-entity   code

ARE THERE ANY MORE ENTITIES   YES/NO

If Yes Continue Onto Next Sheet.
[1] NAME OF ROLE

[2] NAME OF ORGANISATIONAL ENTITY ROLE IS RESPONSIBLE FOR

[3] NAME OF ACTIVITIES PERFORMED BY ROLE

ARE THERE ANY MORE ACTIVITIES? YES/NO
If Yes, Continue Onto Next Sheet
ARE THERE ANY MORE ACTIVITIES  YES/NO

If Yes Continue Onto Next Sheet.
[1] NAME OF ROLE

[2] ROLE PERCEIVES FUNCTIONS OF ORGANISATIONAL-ENTITY TO BE

ARE THERE ANY MORE ORGANISATIONAL ENTITY FUNCTIONS? YES/NO

If Yes, continue onto next sheet.
ARE THERE ANY MORE ORGANISATIONAL ENTITY FUNCTIONS  YES/NO
If Yes Continue Onto Next Sheet.
SECTION: TO MODEL THE MANAGER'S INTERPERSONAL INTERACTIONS OR COMMUNICATION SYSTEM WITH ORGANIZATIONAL MEMBERS & CUSTOMERS

[1] NAME OF MANAGER OR ORGANISATIONAL ROLE

[2] MANAGER'S COMMUNICATION SYSTEM OR INTERPERSONAL INTERACTIONS WITH SUPERIOR(s)

[3] MANAGER'S COMMUNICATION SYSTEM OR INTERPERSONAL INTERACTIONS WITH PEER(s)
MANAGER'S COMMUNICATION SYSTEM OR INTERPERSONAL INTERACTIONS WITH SUPPLIER(s)

- Communication system or interpersonal interactions
  - with supplier(s)
    - external or org-entity
      - provides
        - transformation
      - used-by
        - formal or informal communication channels
    - is
      - based-on
        - formal or informal communication channels
MANAGER’S COMMUNICATION SYSTEM OR INTERPERSONAL INTERACTIONS WITH BENEFICIARY(s)

Communication system or interpersonal interactions

with

is

beneficiary(s)  external or org-entity

receives  produced-by

output  transformation

formal or informal communication channels
SECTION: TO MODEL THE MANAGER'S SYSTEM FOR CONTROLLING AND REGULATING THE DISTANT TRANSFORMATIONS

[1] NAME OF ROLE

role code

administers

[2] MANAGER'S CONTROL & REGULATION SYSTEM

(manager's method of) controlling & regulating (the) system

involves participation of

belongs to

role(s) org-entity

defines

guidelines

received by

control

subordinate(s) distant transformations or activities
SECTION: 

PURPOSE: TO MODEL THE MANAGER’S SYSTEM FOR RECEIVING INFORMATION ON AND MONITORING OF THE DISTANT TRANSFORMATIONS

[1] NAME OF ROLE

role code

belongs-to

[2] NAME OF ORGANISATIONAL ENTITY ROLE
IS RESPONSIBLE FOR

org- code
entity

receives

[3] REPORTING AND MONITORING SYSTEMS

report(s)

generated-by

reporting procedure or information system

processes-info-on

distant transformations

validated-by

monitoring system

uses

structural level monitored

determines

IF THERE ARE MORE REPORTS OR A DIFFERENT SYSTEM CONTINUE ONTO NEXT SHEET
APPENDIX C

VIPLAN BASIC PROGRAM
KEY OFF
CCLR 3,4,8
100 LOAD = ""*
105 LCE$ = "(("
110 LOS$ = "))"
115 LCB$ = "infix"
120 LCO$ = "postfix"
125 LCD$ = "dict"
130 TAS$ = "is-at-level-
135 TBS$ = "is-an"
140 TCS$ = "has"
145 TDS$ = "belongs-to"
150 TES$ = "org-entity"
155 TFS$ = "perceives"
160 TGS$ = "perceived-by"
165 TIS$ = "uses"
170 TJS$ = "used-by"
175 TK$ = "provided-by"
180 TLS$ = "produced-by"
185 TMS$ = "produces"
190 TNS$ = "receives"
195 TYS$ = "receives"
200 TP$ = "performs"
205 TQS$ = "performed-by"
210 TR$ = "controlled-by"
215 TZZ$ = "recognizes"
220 TS$ = "recognizes"
225 TTS$ = "recognized-by"
230 TUS$ = "entails"
235 TVS$ = "entailed-by"
240 TW$ = "is-a"
245 TX$ = " technological-activity"
250 TZ$ = "main-role"
255 X = 1
260 CLS
265 LOCATE 4,35 : PRINT "WELCOME TO"
270 LOCATE 6,5 : PRINT " A CYBERNETIC MODEL FOR VIABILITY PLANNING BY RALF ESPEJO"

135
680 LOCATE 11,8 : PRINT"- level comprises of |
685 LOCATE 12,8 : PRINT"
670 LOCATE 13,8 : PRINT"controlled-by | belongs-to |
675 LOCATE 14,8 : PRINT"
680 LOCATE 15,8 : PRINT" |
685 LOCATE 16,8 : PRINT"
690 LOCATE 17,8 : PRINT" |
695 LOCATE 18,8 : PRINT"
700 LOCATE 19,8 : PRINT" |
705 LOCATE 20,8 : PRINT" role |
710 LOCATE 21,8 : PRINT"
715 LOCATE 22,8 : PRINT"PRESS 1 TO CONTINUE TO NEXT DIAGRAM"
720 LOCATE 23,8 : PRINT"PRESS 2 TO EXIT TO MENU"
725 LOCATE 24,8 : PRINT"MAKE YOUR CHOICE HERE ————*"
730 INPUT Cs
735 IF Cs = "1" GOTO 655
740 IF Cs = "2" GOTO 425
745 BEEP
750 GOTO 616
755 CLS
760 LOCATE 4,8 : PRINT"ACTIVITIES THAT ARE PERFORMED BY MANAGERIAL/SUPERVISORY ROLES"
765 XX = 1
770 LOCATE 8,8 : PRINT" |
775 LOCATE 7,8 : PRINT" |
780 LOCATE 6,8 : PRINT" |
785 IF XX = 2 GOTO 820
790 LOCATE 9,8 : PRINT" |
795 LOCATE 10,8 : PRINT" uses | performs-sp | performed-by produces |
800 LOCATE 11,8: PRINT"Input | ————> | activity | ————> | output |
805 LOCATE 12,8: PRINT" |
810 LOCATE 13,8 : PRINT" |
815 LOCATE 14,8 : PRINT"provided-by | provides | receives |
820 LOCATE 15,8: PRINT" | provided-by | |
825 LOCATE 16,8: PRINT" | |
830 IF XX = 2 GOTO 830
835 IF XX = 2 GOTO 830
760 LOCATE 23, 5: PRINT "ENTER 1 TO CONTINUE & 2 TO EXIT TO MENU"
765 LOCATE 24, 5: PRINT "ENTER YOUR CHOICE HERE ————>
770 LOCATE 23, 43
775 INPUT DS
780 IF DS = "1" GOTO 800
785 IF DS = "2" GOTO 425
790 BEEP
795 GOTO 655
800 CLS
805 LOCATE 4, 5: PRINT "ORGANISATIONAL ENTITY FUNCTIONS PERCEIVED BY MANAGERIAL/S
SUPERVISORY ROLES"
810 XX = 2
815 GOTO 670
820 LOCATE 9, 8: PRINT "perceives | perceived-by"
825 GOTO 655
830 LOCATE 23, 6: PRINT "THERE ARE NO MORE DIAGRAMS ——— PRESS 1 TO EXIT TO MENU"
835 LOCATE 23, 61
840 INPUT ES
845 IF ES = "1" GOTO 425
850 BEEP
855 GOTO 800
860 CLS
865 LOCATE 4, 15: PRINT "GIVE ME 1 - 5 CHARACTERS"  
870 LOCATE 5, 15: PRINT "TO NAME YOUR NEW COM DATA FILE"
875 GOTO 655
880 LOCATE 14, 1: PRINT "THE FILES YOU ALREADY HAVE ARE LISTED BELOW:"  
885 LOCATE 15, 1: PRINT "— ————>
890 LOCATE 8, 15: PRINT "ENTER HERE THE NAME ————>
895 LOCATE 8, 43: INPUT INFILLES
900 CLOSE #1: OPEN INFILLES FOR APPEND AS #1 LEN=255
905 CLS
910 REM BEGIN TO ENTER DATA FOR ORGANISATIONAL DATA MCCML
915 LOCATE 6, 10: PRINT "BEGIN TO ENTER DATA FOR ORGANISATIONAL DATA MCCML MENU"
920 LOCATE 8, 15: PRINT "[1] ENTERING ORGANISATIONAL ENTITY HIERARCHY"
925 LOCATE 10, 15: PRINT "[2] ENTERING WHAT MANAGER/SUPERVISOR PERCEIVES"
930 LOCATE 12, 15: PRINT "[3] ENTERING WHAT MANAGER/SUPERVISOR PERFORMS"
935 LOCATE 14, 15: PRINT "[4] TO GO BACK TO ORGANISATIONAL DATA MCCML MENU"
940 LOCATE 16, 15: PRINT "[5] TO GO BACK TO MAIN MENU"
945 LOCATE 18, 15: PRINT "[6] TO EXIT TO SYSTEM"
950 LOCATE 21, 15: PRINT "ENTER YOUR CHOICE HERE ————>
955 LOCATE 21, 42
960 INPUT FS
965 IF FS = "1" GOTO 1005
970 IF FS = "2" GOTO 1375
975 IF FS = "3" GOTO 2275
980 IF FS = "4" GOTO 425
985 IF FS = "5" GOTO 340
990 IF FS = "6" GOTO 6810
995 BEEP
1000 GOTO 905
1005 CLS
1010 LOCATE 4, 22: PRINT "ENTERING ORGANISATIONAL ENTITY HIERARCHY"
1015 LOCATE 5, 22: PRINT "— ————>
1020 LOCATE 7, 5: PRINT "EACH TIME YOU ENTER THE DATA IT WILL BE LISTED FOR YOU IN FOCLOG FORM"
1025 LOCATE 8,5 : PRINT "YOU CAN THEN DECIDE IF THAT IS THE WAY YOU WISH THE DATA TO BE ENTERED"
1030 LOCATE 9,5 : PRINT "IMPORTANT: NOTE THAT NO RECORD CAN BE MORE THAN TWENTY CHARACTERS LONG"
1031 LOCATE 10,5 : PRINT "AND MAKE SURE THAT CAPITAL LETTERS ARE NOT USED WHEN ENTERING THE DATA"
1035 IF ZX = 1 GOTO 1040
1040 LOCATE 12,54 : PRINT "__________________________
1045 LOCATE 13,5 : PRINT "NAME OF ORGANISATIONAL ENTITY : _____________________"
1050 LOCATE 14,54 : PRINT "__________________________
1055 LOCATE 15,5 : PRINT "WHICH ORGANISATIONAL LEVEL IS ENTITY AT : _____________________"
1060 LOCATE 16,54 : PRINT "__________________________
1065 LOCATE 17,5 : PRINT "WHAT MAIN ROLE DOES THE ENTITY HAVE : _____________________"
1070 LOCATE 18,54 : PRINT "__________________________
1075 LOCATE 21,30 : PRINT "MORE QUESTIONS TO COME"
1080 IF ZX = 1 GOTO 1085
1085 LOCATE 13,62
1090 INPUT AES
1095 LOCATE 15,62
1100 INPUT ACS
1105 LOCATE 17,62
1110 INPUT ADS
1115 CLS
1120 LOCATE 4,10 : PRINT "THE ORGANISATIONAL ENTITY HIERARCHY THAT HAS BEEN ENTERED"
1125 IF ZX = 1 GOTO 1130
1130 LOCATE 9,10 : PRINT AES = "h-at level="ACS
1135 LOCATE 10,10 : PRINT ACS = "a main role"
1140 LOCATE 11,10 : PRINT AES = "a org-entity"
1145 LOCATE 12,10 : PRINT ACS = "controlled-by "ADS
1150 LOCATE 13,10 : PRINT ADS = "belongs-to "ABS
1155 LOCATE 20,2 : PRINT "TO CONTINUE TO ENTER DATA FOR THIS ENTITY PRESS 1"
1160 LOCATE 21,2 : PRINT "TO CHANGE THE ABOVE AND TO REENTER THE DATA PRESS 2"
1165 LOCATE 22,2 : PRINT "IF THE ABOVE ENTITY HAS NO SUB-ENTITIES BUT THERE ARE MORE ENTITIES PRESS 3"
1170 LOCATE 23,2 : PRINT "IF YOU WISH TO GO BACK TO THE MENU WITHOUT ENTERING THE ABOVE DATA PRESS 4"
1175 LOCATE 24,2 : PRINT "IF YOU WISH TO GO BACK TO THE MENU AND THE ABOVE ENTRE RED AND SAVED PRESS 6"
1180 LOCATE 17,2 : PRINT "ENTER YOUR CHOICE HERE — — —"
1185 LOCATE 17,30
1190 INPUT AES
1195 ZX = 1
1200 IF AES = "1" GOTO 4765
1205 IF AES = "2" GOTO 1005
1210 IF AES = "3" GOTO 4770
1215 IF AES = "4" GOTO 605
1220 IF AES = "5" GOTO 4775
1225 BEEP
1230 GOTO 1115
1235 CLS
1240 LOCATE 2,2 : PRINT "WHEN YOU FINISH ENTERING THE DATA THE SYSTEM WILL DIS
LAY THE PROLOG FORM AND
1245 LOCATE 3, 2: PRINT "THEN BEGINS TO ASK YOU A NUMBER OF QUESTIONS CONCERNING" G THE REST OF THE DATA!"
1250 LOCATE 6, 10: PRINT "WHAT ORGANISATIONAL SUB-ENTITIES BELONG TO "ABS"
1255 LOCATE 8, 25: PRINT "__________________________________________" 1
1260 LOCATE 9, 24: PRINT "|________________________________________________|
1265 LOCATE 10, 25: PRINT "__________________________________________" 1
1270 LOCATE 9, 24
1275 INPUT AGS
1280 LOCATE 12, 24: PRINT AGS " has "AGS 1
1285 LOCATE 13, 24: PRINT AGS " belongs-to "AGS 1
1290 LOCATE 14, 24: PRINT AGS " is-an org-entity" 1
1295 LOCATE 16, 10: PRINT "ENTER YOUR CHOICE HERE -->" 1
1300 LOCATE 18, 1: PRINT "ENTER 1 IF ABOVE IS CORRECT AND THERE ARE MORE SUB-ENTITIES"
1305 LOCATE 22, 1: PRINT "ENTER 5 IF ABOVE IS CORRECT AND THERE ARE 'NO' MORE SUB-ENTITIES BUT THERE ARE" 1
1310 LOCATE 23, 12: PRINT "MORE ENTITIES TO BE ENTERED"
1315 LOCATE 20, 1: PRINT "ENTER 3 IF THE ABOVE IS NOT CORRECT AND YOU WISH TO RE-
1320 LOCATE 21, 1: PRINT "ENTER 4 IF ABOVE IS NOT CORRECT AND YOU WISH TO EXIT TO MENU WITHOUT SAVING IT"
1325 LOCATE 19, 1: PRINT "ENTER 2 IF ABOVE IS CORRECT AND YOU WISH TO EXIT TO MENU"
1330 LOCATE 16, 39
1335 INPUT AGS
1340 IF AGS = "1" GOTO 4620
1345 IF AGS = "2" GOTO 4625
1350 IF AGS = "3" GOTO 1235
1355 IF AGS = "4" GOTO 605
1360 IF AGS = "5" GOTO 4830
1365 BEEP
1370 GOTO 1235
1375 REM ENTERING WHAT MANAGER/SUPERVISOR PERCEIVES
1380 IF FES = "2" GOTO 1400
1385 CLS
1390 LOCATE 2, 49: PRINT "__________________________________________" 1
1395 LOCATE 3, 1: PRINT "NAME OF MAIN ROLE -->" 1
1400 LOCATE 4, 49: PRINT "__________________________________________" 1
1405 LOCATE 5, 1: PRINT "WHAT ORG-ENTITY-FUNCTION DOES HE/SHE PERCEIVE -->" 1
1410 LOCATE 6, 49: PRINT "__________________________________________" 1
1415 LOCATE 7, 1: PRINT "WHAT INPUT DOES THE ORG-ENTITY-FUNCTION USE -->" 1
1420 LOCATE 8, 49: PRINT "__________________________________________" 1
1425 LOCATE 9, 1: PRINT "IS THIS THE ONLY INPUT (Y CR n) -->" 1
1430 LOCATE 10, 49: PRINT "__________________________________________" 1
1435 LOCATE 11, 1: PRINT "WHAT SOURCE PROVIDES THE ABOVE INPUT -->" 1
1440 LOCATE 12, 49: PRINT "__________________________________________" 1
1445 LOCATE 13, 1: PRINT "IS THIS THE ONLY SOURCE FOR THE INPUT (Y CR n) -->" 1
1450 LOCATE 14, 49: PRINT "__________________________________________" 1
1455 LOCATE 16,1 : PRINT "WHAT DOES THE CRG-ENTITY-FUNCTION PRODUCE ---> !
1460 LOCATE 16,49: PRINT "-----------------------------"  
1465 LOCATE 17,1 : PRINT "IS THIS THE ONLY OUTPUT (Y OR N)
1470 LOCATE 18,49: PRINT "-----------------------------"  
1475 LOCATE 19,1 : PRINT "WHICH DESTINATION RECEIVES THE OUTPUT ---> !
1480 LOCATE 20,49: PRINT "-----------------------------"  
1485 LOCATE 21,1 : PRINT "IS THIS THE ONLY DESTINATION THAT RECEIVES THE OUTPUT
1490 LOCATE 3,47
1495 INPUT AMS
1500 LOCATE 5,47
1505 INPUT AHS
1510 LOCATE 7,47
1515 INPUT AIS
1520 LOCATE 9,47
1525 INPUT AIS
1530 LOCATE 11,47
1535 INPUT AJS
1540 LOCATE 13,47
1545 INPUT AJS
1550 LOCATE 15,47
1555 INPUT AKS
1560 LOCATE 17,47
1565 INPUT AKS
1570 LOCATE 19,47
1575 INPUT ALS
1580 LOCATE 21,47
1585 ERROR
1590 CLS
1595 LOCATE 4,10 : PRINT AMS perceives "AHS
1600 LOCATE 5,10 : PRINT AMS perceived-by "AHS
1605 LOCATE 6,10 : PRINT AHS uses "AIS
1610 LOCATE 7,10 : PRINT AIS used-by "AHS
1615 LOCATE 8,10 : PRINT AIS provided-by "AJS
1620 LOCATE 9,10 : PRINT AJS provides "AIS
1625 LOCATE 10,10: PRINT AKS produces "AKS
1630 LOCATE 11,10: PRINT AKS produced-by "AHS
1635 LOCATE 12,10: PRINT AKS received-by "ALS
1640 LOCATE 13,10: PRINT ALS receives "AKS
1645 LOCATE 16,1 : PRINT "PRESS 1 IF ABOVE IS CORRECT & YOU WANT IT SAVED BUT T
1650 LOCATE 17,1 : PRINT "PRESS 2 IF ABOVE IS CORRECT & YOU WANT IT SAVED, THERE
1655 LOCATE 18,1 : PRINT "PRESS 3 IF ABOVE IS CORRECT AND YOU WANT IT SAVED BUT T
1660 LOCATE 19,1 : PRINT " FOR A DIFFERENT MANAGER/SUPERVISOR OR PREVIOUS
1665 LOCATE 20,1 : PRINT "PRESS 4 IF ABOVE IS INCORRECT AND YOU WANT TO REENTER
1670 LOCATE 21,1 : PRINT "PRESS 5 IF ABOVE IS INCORRECT AND YOU DON'T WANT IT S
1675 LOCATE 22,1 : PRINT " TO EXIT TO MENU"
1660 LOCATE 24, 1: PRINT "MAKE YOUR CHOICE HERE ———>"
1665 LOCATE 23, 29
1670 IF ANS = "1": GOTO 4865
1700 IF ANS = "2": GOTO 4870
1705 IF ANS = "3": GOTO 4875
1710 IF ANS = "4": GOTO 1375
1715 IF ANS = "5": GOTO 805
1720 BEEP
1725 GOTO 1590
1730 IF A1S = "n": GOTO 1755
1735 IF AJLS = "n": GOTO 1605
1740 IF AKLS = "n": GOTO 2015
1745 IF ALLS = "n": GOTO 2165
1750 GOTO 1680
1755 CLS
1760 LOCATE 4, 20: PRINT "WHAT OTHER INPUT IS USED BY " AHS
1765 LOCATE 6, 20: PRINT "                  ", AHS
1770 LOCATE 7, 20: PRINT "                  "
1775 LOCATE 8, 20: PRINT "                  "
1780 LOCATE 7, 24
1785 INPUT RAHS
1790 LOCATE 11, 20: PRINT "WHAT SOURCE PROVIDES " RAHS
1795 LOCATE 12, 20: PRINT "                  ", RAHS
1800 LOCATE 13, 20: PRINT "                  "
1805 LOCATE 14, 20: PRINT "                  "
1810 LOCATE 13, 24
1815 INPUT SAHS
1820 LOCATE 15, 20: PRINT RAHS " provided-by " SAHS
1825 LOCATE 16, 20: PRINT SAHS " provides " RAHS
1830 LOCATE 9, 20: PRINT AHS " uses " RAHS
1835 LOCATE 10, 20: PRINT RAHS " used-by " AHS
1840 LOCATE 18, 5: PRINT "PRESS 1 IF THERE ARE MORE INPUTS USED BY " AHS
1845 LOCATE 19, 5: PRINT "PRESS 2 IF ABOVE IS INCORRECT AND YOU WANT TO REENTER THE DATA"
1850 LOCATE 20, 5: PRINT "PRESS 3 IF THERE ARE NO MORE INPUTS AND ABOVE SAVE" 
1855 LOCATE 21, 5: PRINT "PRESS 4 IF ABOVE INCORRECT & TO EXIT WITHOUT SAVING"
1860 LOCATE 23, 5: PRINT "ENTER YOUR CHOICE HERE ———>"
1865 LOCATE 23, 33
1870 INPUT TAHS
1875 IF TAHS = "1": GOTO 5310
1880 IF TAHS = "2": GOTO 1755
1885 IF TAHS = "3": GOTO 5315
1890 IF TAHS = "4": GOTO 1725
1895 BEEP
1900 GOTO 1860
1905 CLS
1910 LOCATE 4, 20: PRINT "WHAT OTHER SOURCE PROVIDES " A1S
1915 LOCATE 6, 20: PRINT "                  ", A1S
1920 LOCATE 7, 20: PRINT "                  "
1925 LOCATE 8, 20: PRINT "                  "
1930 LOCATE 7, 24
1935 INPUT RAIs
1940 LOCATE 10, 20: PRINT AIs " provided-by " RAIs
1945 LOCATE 11, 20: PRINT RAIs " provides " A1S
LOCATE 18, 1: PRINT "ENTER 1 IF ABOVE IS CORRECT AND THERE ARE NO MORE SOURCES"
LOCATE 19, 1: PRINT "ENTER 2 IF ABOVE IS CORRECT & THERE ARE MORE SOURCES"
LOCATE 20, 1: PRINT "ENTER 3 IF ABOVE IS INCORRECT AND YOU WANT TO REENTER THE DATA"
LOCATE 21, 1: PRINT "ENTER 4 IF ABOVE IS INCORRECT & TO EXIT WITHOUT SAVING"
LOCATE 23, 20: PRINT "ENTER YOUR CHOICE HERE ———>"
LOCATE 23, 48
INPUT SA1S
IF SA1S = "1" THEN GOTO 5345
IF SA1S = "2" THEN GOTO 5355
IF SA1S = "3" THEN GOTO 1525
IF SA1S = "4" THEN GOTO 1740
BEEP
GOTO 1970
CLS
LOCATE 4, 20: PRINT "WHICH OTHER OUTPUTS ARE PRODUCED BY "AHS"
LOCATE 6, 20: PRINT " "
LOCATE 7, 20: PRINT " "
LOCATE 8, 20: PRINT " "
LOCATE 9, 27
INPUT UAHs
LOCATE 10, 20: PRINT "AHS" produces "UAHS"
LOCATE 11, 20: PRINT "UAHS" produced by "AHS"
LOCATE 13, 20: PRINT "WHICH DESTINATION RECEIVES "UAHS"
LOCATE 14, 20: PRINT " "
LOCATE 16, 20: PRINT " "
LOCATE 16, 20: PRINT " "
LOCATE 17, 20
INPUT VAHS
LOCATE 17, 20: PRINT "VAHS" receives "UAHS"
LOCATE 18, 20: PRINT "UAHS" received by "VAHS"
LOCATE 19, 1: PRINT "ENTER 1 IF ABOVE IS CORRECT AND THERE ARE NO MORE OUTPUTS"
LOCATE 20, 1: PRINT "ENTER 2 IF ABOVE IS CORRECT AND THERE ARE MORE OUTPUTS"
LOCATE 21, 1: PRINT "ENTER 3 IF ABOVE IS INCORRECT AND YOU WANT TO REENTER THE DATA"
LOCATE 22, 1: PRINT "ENTER 4 IF ABOVE IS INCORRECT & TO EXIT WITHOUT SAVING"
LOCATE 24, 20: PRINT "ENTER YOUR CHOICE HERE ———>"
LOCATE 24, 48
INPUT WAHS
IF WAHS = "1" THEN GOTO 5360
IF WAHS = "2" THEN GOTO 5385
IF WAHS = "3" THEN GOTO 2015
IF WAHS = "4" THEN GOTO 1745
BEEP
GOTO 2120
CLS
LOCATE 2, 20: PRINT "WHAT OTHER DESTINATION RECEIVES "AKS"
LOCATE 4, 20: PRINT " "
LOCATE 5, 20: PRINT " "
LOCATE 8, 20: PRINT " "
2180 LOCATE 5,24
2185 INPUT RAKS
2200 LOCATE 7,20: PRINT AKS " received by " RAKS
2215 LOCATE 8,20: PRINT RAKS " receives " AKS
2220 LOCATE 18,1: PRINT "ENTER 1 IF ABOVE IS CORRECT AND THERE ARE NO MORE DESTINATIONS"
2225 LOCATE 19,1: PRINT "ENTER 2 IF ABOVE IS CORRECT AND THERE ARE MORE DESTINATIONS"
2230 LOCATE 20,1: PRINT "ENTER 3 IF ABOVE IS INCORRECT AND YOU WANT TO REENTER THE DATA"
2235 LOCATE 21,1: PRINT "ENTER 4 IF ABOVE IS INCORRECT & TO EXIT WITHOUT SAVING"
2240 LOCATE 22,20: PRINT "ENTER YOUR CHOICE HERE -->"
2245 INPUT SAKS
2250 IF SAKS = "1" GOTO 5420
2255 IF SAKS = "2" GOTO 5425
2260 IF SAKS = "3" GOTO 2185
2265 IF SAKS = "4" GOTO 1650
2270 BEEP
2275 GOTO 2220
2280 REM ENTERING DATA FOR WHAT MANAGER/SUPERVISOR PERFORMS
2285 CLS
2290 LOCATE 2,57: PRINT " "
2295 LOCATE 3,5: PRINT "NAME OF MAIN ROLE
2300 LOCATE 6,5: PRINT "WHAT ACTIVITY IS PERFORMED BY MAIN ROLE
2305 LOCATE 8,5: PRINT "WHAT INPUT DOES THE ACTIVITY USE
2310 LOCATE 10,5: PRINT "IS THIS THE ONLY INPUT (y or n)
2315 LOCATE 11,5: PRINT "WHAT SOURCE PROVIDES THE INPUT
2320 LOCATE 12,5: PRINT "IS THIS THE ONLY SOURCE FOR THE INPUT (y or n)
2325 LOCATE 14,5: PRINT "WHAT OUTPUT IS PRODUCED BY THE ACTIVITY
2330 LOCATE 16,5: PRINT "IS THIS THE ONLY OUTPUT PRODUCED (y or n)
2335 LOCATE 18,5: PRINT "WHAT DESTINATION RECEIVES THE OUTPUT
2340 LOCATE 20,5: PRINT "IS THIS THE ONLY DESTINATION FOR THE OUTPUT (y or n)
2345 LOCATE 3,55
2350 INPUT ACS
2325 LOCATE 6,55
2400 INPUT APS
2405 LOCATE 7,55
2410 INPUT ACS
2415 LOCATE 9,55
2420 INPUT ACCS
2425 LOCATE 11,55
2430 INPUT ARS
2435 LOCATE 13,55
2440 INPUT ARS$
2445 LOCATE 15,55
2450 INPUT ASS$
2455 LOCATE 17,55
2460 INPUT ASS$
2465 LOCATE 19,55
2470 INPUT ATS$
2475 LOCATE 21,55
2480 INPUT ATTS$
2485 CLS
2490 LOCATE 4,10 : PRINT AOS$ "performs "APS
2495 LOCATE 5,10 : PRINT APS $ "performed-by "AOS
2500 LOCATE 6,10 : PRINT APS $ "uses "ACS
2505 LOCATE 7,10 : PRINT AQS $ "used-by "APS
2510 LOCATE 8,10 : PRINT AQS $ "provided-by "ARS
2515 LOCATE 9,10 : PRINT ARS $ "provides "AQS
2520 LOCATE 10,10 : PRINT APS $ "produces "ASS
2525 LOCATE 11,10 : PRINT ASS $ "produced-by "APS
2530 LOCATE 12,10 : PRINT ATS $ "received-by "ATS
2535 LOCATE 13,10 : PRINT ATS $ "receives "ASS
2540 LOCATE 16,1 : PRINT "PRESS 1 IF ABOVE IS CORRECT & YOU WANT IT SAVED ELSE THERE IS MORE SUB-DATA"
2545 LOCATE 17,1 : PRINT "PRESS 2 IF ABOVE IS CORRECT & YOU WANT IT SAVED, THERE IS NO MORE DATA & EXIT"
2550 LOCATE 18,1 : PRINT "PRESS 3 IF ABOVE IS CORRECT AND YOU WANT IT SAVED BUT THERE IS MORE DATA"
2555 LOCATE 19,1 : PRINT "FOR A DIFFERENT MANAGER/SUPERVISOR"
2560 LOCATE 20,1 : PRINT "PRESS 4 IF ABOVE IS INCORRECT AND YOU WANT TO REENTER THE DATA"
2565 LOCATE 21,1 : PRINT "PRESS 5 IF ABOVE IS INCORRECT AND YOU DON'T WANT IT SAVED AND YOU WANT"
2570 LOCATE 22,1 : PRINT "TO EXIT TO MENU"
2575 LOCATE 24,1 : PRINT "MAKE YOUR CHOICE HERE ----->"
2580 LOCATE 23,29
2585 INPUT AWS
2590 IF AWS = "1" GOTO 4945
2595 IF AWS = "2" GOTO 4950
2600 IF AWS = "3" GOTO 4955
2605 IF AWS = "4" GOTO 2250
2610 IF AWS = "5" GOTO 3055
2615 SLEEP
2620 GOTO 2575
2625 IF ACCS$ = "n" GOTO 2650
2630 IF ARS$ = "n" GOTO 2600
2635 IF ASSS$ = "n" GOTO 2910
2640 IF ATTS$ = "n" GOTO 3060
2545 GOTO 2485
2550 CLS
2555 LOCATE 4, 20: PRINT "WHAT OTHER INPUT IS USED BY "AP$"
2560 LOCATE 6, 20: PRINT " "
2565 LOCATE 7, 20: PRINT "!"
2570 LOCATE 8, 20: PRINT "!"
2575 LOCATE 7, 24
2580 INPUT RAP$,
2585 LOCATE 11, 20: PRINT "WHAT SOURCE PROVIDES "RAP$"
2590 LOCATE 12, 20: PRINT " "
2595 LOCATE 13, 20: PRINT "!"
2600 LOCATE 14, 20: PRINT "!"
2605 LOCATE 13, 24
2610 INPUT SAP$,
2615 LOCATE 15, 20: PRINT RAP$ "provided-by "SAP$"
2620 LOCATE 16, 20: PRINT SAP$ "provides "RAP$"
2625 LOCATE 9, 20: PRINT AP$ "uses "RAP$"
2630 LOCATE 10, 20: PRINT RAP$ "used-by "AP$"
2635 LOCATE 18, 5: PRINT "PRESS 1 IF THERE ARE ANY MORE INPUTS USED BY "AP$"
2640 LOCATE 19, 5: PRINT "PRESS 2 IF ABOVE IS INCORRECT AND YOU WANT TO REENTER THE DATA"
2645 LOCATE 20, 5: PRINT "PRESS 3 IF THERE ARE NO MORE INPUTS AND ABOVE SAVED"
2650 LOCATE 21, 5: PRINT "PRESS 4 IF ABOVE IS INCORRECT, NOT SAVED AND TO EXIT"
2655 LOCATE 23, 5: PRINT "ENTER YOUR CHOICE HERE ———>
2660 LOCATE 23, 33
2665 INPUT TAPS
2670 IF TAPS = "1" GOTO 5460
2675 IF TAPS = "2" GOTO 2550
2680 IF TAPS = "3" GOTO 5455
2685 IF TAPS = "4" GOTO 2530
2690 BEEP
2695 GOTO 2755
2700 CLS
2705 LOCATE 4, 20: PRINT "WHAT OTHER SOURCE PROVIDES "AQ$"
2710 LOCATE 6, 20: PRINT " "
2715 LOCATE 7, 20: PRINT "!"
2720 LOCATE 8, 20: PRINT "!"
2725 LOCATE 7, 24
2730 INPUT RAC$,
2735 LOCATE 10, 20: PRINT AQ$ "provided-by "RAC$"
2740 LOCATE 11, 20: PRINT RAC$ "provides "AQ$"
2745 LOCATE 18, 1: PRINT "ENTER 1 IF ABOVE IS CORRECT AND THERE ARE NO MORE SOURCES"
2750 LOCATE 19, 1: PRINT "ENTER 2 IF ABOVE IS CORRECT AND THERE ARE MORE SOURCES"
2755 LOCATE 20, 1: PRINT "ENTER 3 IF ABOVE IS INCORRECT AND YOU WANT TO REENTER THE DATA"
2760 LOCATE 21, 1: PRINT "ENTER 4 IF ABOVE IS INCORRECT, NOT SAVED AND TO EXIT"
2765 LOCATE 23, 20: PRINT "ENTER YOUR CHOICE HERE ———>
2770 LOCATE 23, 48
2775 INPUT SAC$,
2780 IF SAC$ = "1" GOTO 5460
2785 IF SAC$ = "2" GOTO 5455
2790 IF SAC$ = "3" GOTO 2500
2795 IF SAC$ = "4" GOTO 2535
2900 BEEP
2905 GOTO 2955
2910 CLS
2915 LOCATE 4, 20: PRINT "WHICH OTHER OUTPUTS ARE PRODUCED BY "AP$
2920 LOCATE 6, 20: PRINT "  
2925 LOCATE 7, 20: PRINT "                        
2930 LOCATE 8, 20: PRINT "                        
2935 LOCATE 7, 25
2940 INPUT UAPS
2945 LOCATE 10, 20: PRINT UAPS " produces "UAPS
2950 LOCATE 11, 20: PRINT UAPS " produced by "AP$
2955 LOCATE 13, 20: PRINT "WHICH DESTINATION RECEIVES "UAPS
2960 LOCATE 14, 20: PRINT "  
2965 LOCATE 15, 20: PRINT "                        
2970 LOCATE 16, 20: PRINT "                        
2975 LOCATE 15, 25
2980 INPUT VAPS
2985 LOCATE 17, 20: PRINT VAPS " receives "UAPS
2990 LOCATE 18, 20: PRINT UAPS " received by "VAPS
2995 LOCATE 19, 1: PRINT "ENTER 1 IF ABOVE IS CORRECT AND THERE ARE NO MORE OUTPUTS"
3000 LOCATE 20, 1: PRINT "ENTER 2 IF ABOVE IS CORRECT AND THERE ARE MORE OUTPUTS"
3005 LOCATE 21, 1: PRINT "ENTER 3 IF ABOVE IS INCORRECT AND YOU WANT TO REENTER THE DATA"
3010 LOCATE 22, 1: PRINT "ENTER 4 IF ABOVE IS INCORRECT, NOT SAVED AND TO EXIT"
3015 LOCATE 24, 20: PRINT "ENTER YOUR CHOICE HERE -->"
3020 LOCATE 23, 48
3025 INPUT VAPS
3030 IF VAPS = "1" GOTO 5620
3035 IF VAPS = "2" GOTO 5625
3040 IF VAPS = "3" GOTO 2910
3045 IF VAPS = "4" GOTO 2640
3050 BEEP
3055 GOTO 2915
3060 CLS
3065 LOCATE 2, 20: PRINT "WHICH OTHER DESTINATION RECEIVES "ASS
3070 LOCATE 4, 20: PRINT "                        
3075 LOCATE 5, 20: PRINT "                        
3080 LOCATE 6, 20: PRINT "                        
3085 LOCATE 5, 23
3090 INPUT RASS
3095 LOCATE 7, 20: PRINT RASS " received by "RASS
3100 LOCATE 8, 20: PRINT RASS " receives "ASS
3105 LOCATE 18, 1: PRINT "ENTER 1 IF ABOVE IS CORRECT AND THERE ARE NO MORE DESTINATIONS"
3110 LOCATE 19, 1: PRINT "ENTER 2 IF ABOVE IS CORRECT AND THERE ARE MORE DESTINATIONS"
3115 LOCATE 20, 1: PRINT "ENTER 3 IF ABOVE IS INCORRECT AND YOU WANT TO REENTER THE DATA"
3120 LOCATE 21, 1: PRINT "ENTER 4 IF ABOVE IS INCORRECT, NOT SAVED AND TO EXIT"
3125 LOCATE 22, 20: PRINT "ENTER YOUR CHOICE HERE -->"
3130 LOCATE 23, 48
3135 INPUT RASS
3140 IF RASS = "1" GOTO 5620
3145 IF SASS = "2" GOTO 5555
3160 IF SASS = "3" GOTO 3660
3165 IF SASS = "4" GOTO 2455
3170 BEEP
3175 GOTO 3125
3170 REM MENU FOR TECHNOLOGICAL DATA MODEL
3175 CLS
3180 LOCATE 4,20 :PRINT "TECHNOLOGICAL DATA MODEL MENU"
3185 LOCATE 5,20 :PRINT ""
3190 LOCATE 7,15 :PRINT "[1] STRUCTURAL DIAGRAMS OF THE MODEL"
3195 LOCATE 9,15 :PRINT "[2] TO BEGIN TO ENTER DATA FOR THE MODEL"
3200 LOCATE 11,15 :PRINT "[3] TO GO BACK TO MAIN MENU"
3205 LOCATE 13,15 :PRINT "[4] TO EXIT TO SYSTEM"
3210 LOCATE 15,15 :PRINT "[5] TO GO TO ORGANISATIONAL DATA MODEL"
3215 LOCATE 18,15 :PRINT "ENTER YOUR CHOICE HERE "
3220 LOCATE 18,53
3225 INPUT BAS
3230 IF BAS = "1" GOTO 3265
3235 IF BAS = "2" GOTO 3464
3240 IF BAS = "3" GOTO 3440
3245 IF BAS = "4" GOTO 6610
3250 IF BAS = "5" GOTO 425
3255 BEEP
3260 GOTO 3170
3265 CLS
3270 LOCATE 4,15 :PRINT "STRUCTURE OF TECHNOLOGICAL DATA MODEL - DIAGRAM 1"
3275 LOCATE 5,15 :PRINT "perceives"
3280 LOCATE 7,20 :PRINT "viewpoint"
3285 LOCATE 8,19 :PRINT "business-
area"
3290 LOCATE 9,19 :PRINT "recognizes"
3295 LOCATE 10,19 :PRINT "entailed-by"
3300 LOCATE 11,20 :PRINT "perceived-by"
3305 LOCATE 14,6 :PRINT "role"
3310 LOCATE 15,6 :PRINT "activity"
3315 LOCATE 16,6 :PRINT "activity"
3320 LOCATE 17,6 :PRINT "activity"
3325 LOCATE 18,6 :PRINT "activity"
3330 LOCATE 19,6 :PRINT "activity"
3335 LOCATE 22,15 :PRINT "ENTER HERE 1 TO CONTINUE :2 TO EXIT TO MENU "
3340 GOTO 22,65
3345 INPUT BAS
3350 IF BAS = "1" GOTO 3370
3355 IF BAS = "2" GOTO 3170
3360 BEEP
3365 GOTO 3265
3370 CLS
3375 LOCATE 2,20 :PRINT "STRUCTURE OF TECHNOLOGICAL DATA MODEL - DIAGRAM 2"
3380 LOCATE 5,6 :PRINT "uses"
3385 LOCATE 6,6 :PRINT "produces"

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3325 LOCATE 6,6 :PRINT" ! tech-> !
| !
3320 LOCATE 7,6 :PRINT" ! Input ! activity !
|!
cut put !
3325 LOCATE 8,6 :PRINT" ! tech-> ! used-by !
| !
3400 LOCATE 9,6 :PRINT" ! produced-by ---
|!
3405 LOCATE 10,6 :PRINT" !
|!
3410 LOCATE 11,1 :PRINT" provided-! provides 1st ! rec
|ived-! receives"
3415 LOCATE 12,6 :PRINT" by !
| by
3420 LOCATE 13,6 :PRINT"
|!
3425 LOCATE 14,6 :PRINT" ! primary CR !
|!
3430 LOCATE 15,6 :PRINT" ! source ! functional !
| dest-
3435 LOCATE 16,6 :PRINT" ! activity !
| nation
3440 LOCATE 17,6 :PRINT"
|!
3445 LOCATE 20,16 :PRINT" PRESS ANY KEY AND "RETURN" TO EXIT TO MENU"  
3450 LOCATE 20,58
3455 INPUT AAA$  
3460 GOTO 3170  
3464 CLS  
3465 LOCATE 4,15 :PRINT "GIVE ME 1 - 5 CHARACTERS"
3466 LOCATE 6,15 :PRINT "TO NAME YOUR NEW TCM DATA FILE"  
3467 LOCATE 8,15 :PRINT "FOR EXAMPLE: TYPE "TEST.2""  
3468 LOCATE 14,1 :PRINT "THE FILES YOU ALREADY HAVE ARE LISTED BELOW:";FILES  
3469 LOCATE 15,1 :PRINT "--------"  
3470 LOCATE 8,15 :PRINT "ENTER HERE THE NAME -------"  
3471 LOCATE 8,43 :INPUT INFILSys  
3472 CLOSE #2;OPEN INFILSys FOR APPEND AS #2 LEN=256  
3475 REM BEGINS TO ENTER DATA FOR TECHNOCLOGICAL DATA MODEL  
3480 CLS  
3485 LOCATE 6,10 :PRINT"BEGIN TO ENTER DATA FOR TECHNOCLOGICAL DATA MODEL MENU"  
3490 LOCATE 7,10 :PRINT"--------"  
3495 LOCATE 9,15 :PRINT"[1] ENTERING DATA ON VIEWPOINTS."  
3500 LOCATE 11,15 :PRINT"[2] ENTERING DATA ON THE TECHNOCLOGICAL ACTIVITIES"  
3505 LOCATE 13,15 :PRINT" RECOGNIZED BY ROLE"  
3510 LOCATE 15,15 :PRINT"[3] ENTERING DATA ON THE TECHNOCLOGICAL ACTIVITIES"  
3515 LOCATE 17,15 :PRINT"[4] TO GO BACK TO TECHNOCLOGICAL DATA MODEL MENU"  
3520 LOCATE 19,15 :PRINT"[5] TO GO TO MAIN MENU"  
3525 LOCATE 21,15 :PRINT"[6] TO EXIT TO SYSTEM"  
3530 LOCATE 23,15 :PRINT"ENTER YOUR CHOICE HERE -------"  
3535 LOCATE 23,44  
3540 INPUT CAS  
3545 IF CAS = "1" GOTO 3565  
3550 IF CAS = "2" GOTO 3720  
3555 IF CAS = "3" GOTO 3590  
3560 IF CAS = "4" GOTO 3170
3565 IF CAS = "5" GOTO 340
3570 IF CAS = "6" GOTO 6510
3575 BEEP
3580 GOTO 3480
3585 CLS
3590 LOCATE 2,27 : PRINT"ENTERING DATA ON VIEWPOINTS"
3595 LOCATE 3,27 : PRINT"
3600 LOCATE 6,56 : PRINT"
3605 LOCATE 7,9 : PRINT"NAME OF INDIVIDUAL REPRESENTING THE VIEWPOINT !
3610 LOCATE 8,56 : PRINT"
3615 LOCATE 9,9 : PRINT"NAME THE BUSINESS AREA PERCEIVED BY VIEWPOINT !
3620 LOCATE 10,56: PRINT"
3625 LOCATE 7,54
3630 INPUT DAS
3635 LOCATE 9,54
3640 INPUT DBS
3645 LOCATE 12,9 : PRINT DAS" perceives "DBS
3650 LOCATE 13,9 : PRINT DBS" perceived-by "DAS
3655 LOCATE 15,1 : PRINT"PRESS 1 IF ABOVE IS INCORRECT AND YOU WANT TO REENTER
3660 LOCATE 16,1 : PRINT"THE DATA"
3665 LOCATE 17,1 : PRINT"PRESS 2 IF ABOVE IS INCORRECT AND YOU DON'T WANT IT SAV
3670 LOCATE 18,1 : PRINT"PRESS 4 IF ABOVE IS CORRECT AND YOU WANT IT SAVED BUT
3675 LOCATE 20,1 : PRINT"ENTER YOUR CHOICE HERE -->
3680 LOCATE 20,30
3685 INPUT DC5
3690 IF DC5 = "1" GOTO 3585
3695 IF DC5 = "2" GOTO 3480
3700 IF DC5 = "3" GOTO 5025
3705 IF DC5 = "4" GOTO 5030
3710 BEEP
3715 GOTO 3675
3720 CLS
3725 LOCATE 2,9 :PRINT"ENTERING DATA ON THE TECHNOLOGICAL ACTIVITIES RECOGNIZED
3730 LOCATE 3,9 :PRINT"
3735 LOCATE 4,54 :PRINT"
3740 LOCATE 5,9 :PRINT"NAME OF ROLE
3745 LOCATE 6,54 :PRINT"
3750 LOCATE 7,9 :PRINT"THE TECH-ACTIVITY RECOGNIZED BY ROLE
3755 LOCATE 8,54 :PRINT"
3760 LOCATE 9,9 :PRINT"THE BUSINESS AREA THAT ENTAILS THE
3765 LOCATE 10,54:PRINT"
3770 LOCATE 10,9 :PRINT"TECHNOLOGICAL ACTIVITY.
3775 LOCATE 5,52
3780 INPUT FAS
3765 LOCATE 7,52
3770 INPUT FES
3775 LOCATE 9,52
3780 INPUT FCS
3785 LOCATE 12,9 :PRINT FAS" recognizes "FES
3790 LOCATE 13,9 :PRINT FBS" recognized by "FAS
3795 LOCATE 14,9 :PRINT FBS" entailed by "FCS
3800 LOCATE 15,9 :PRINT FCS" entails "FBS
3805 LOCATE 17,1 :PRINT "ENTER 1 IF ABOVE IS INCORRECT AND YOU WANT TO REENTER THE DATA"
3810 LOCATE 18,1 :PRINT "ENTER 2 IF ABOVE IS INCORRECT AND YOU DON'T WANT TO SAVE IT AND TO EXIT"
3815 LOCATE 19,1 :PRINT "ENTER 3 IF ABOVE IS CORRECT AND YOU WANT IT SAVED AND THERE IS MORE DATA"
3820 LOCATE 20,1 :PRINT "ENTER 4 IF ABOVE IS CORRECT AND THERE IS NO MORE DATA AND YOU WANT TO EXIT"
3825 LOCATE 22,1 :PRINT "ENTER YOUR CHOICE HERE --->"
3830 LOCATE 22,30
3835 INPUT FDS
3840 IF FDS = "1" GOTO 3720
3845 IF FDS = "2" GOTO 3460
3850 IF FDS = "3" GOTO 6055
3855 IF FDS = "4" GOTO 6050
3860 BEEP
3865 GOTO 3845
3870 REM ENTERING DATA FOR THE TECHNOLOGICAL ACTIVITIES
3875 CLS
3880 LOCATE 2,18 :PRINT "ENTERING DATA ON THE TECHNOLOGICAL ACTIVITIES"
3885 LOCATE 3,18 :PRINT "--
3890 LOCATE 5,54 :PRINT "NAME OF TECH-ACTIVITY -->
3895 LOCATE 6,9 :PRINT "NAME OF INPUT Used BY TECH-ACTIVITY -->
3900 LOCATE 7,54 :PRINT "IS THE ABOVE INPUT THE ONLY ONE (Y OR N)"
3905 LOCATE 8,9 :PRINT "NAME OF SOURCE PROVIDING THE INPUT -->
3910 LOCATE 9,54 :PRINT "IS THE ABOVE SOURCE THE ONLY ONE (Y OR N)"
3915 LOCATE 10,9 :PRINT "NAME OF SOURCE PROVIDING THE INPUT -->
3920 LOCATE 11,54 :PRINT "IS THE ABOVE SOURCE THE ONLY ONE (Y OR N)"
3925 LOCATE 12,9 :PRINT "NAME OF SOURCE PROVIDING THE INPUT -->
3930 LOCATE 13,54 :PRINT "IS THE ABOVE SOURCE THE ONLY ONE (Y OR N)"
3935 LOCATE 14,9 :PRINT "IS THE ABOVE SOURCE THE ONLY ONE (Y OR N)"
3940 LOCATE 15,54 :PRINT "NAME OF SOURCE PROVIDING THE INPUT -->
3945 LOCATE 16,9 :PRINT "NAME OF SOURCE PROVIDING THE INPUT -->
3950 LOCATE 17,54 :PRINT "IS THE ABOVE OUTPUT THE ONLY ONE (Y OR N)"
3955 LOCATE 18,9 :PRINT "IS THE ABOVE OUTPUT THE ONLY ONE (Y OR N)"
3960 LOCATE 19,54 :PRINT "IS THE ABOVE OUTPUT THE ONLY ONE (Y OR N)"
3965 LOCATE 20,9 :PRINT "IS THE ABOVE OUTPUT THE ONLY ONE (Y OR N)"
3970 LOCATE 21,54 :PRINT "IS THE ABOVE DESTINATION RECEIVES THE OUTPUT -->
3975 LOCATE 22,9 :PRINT "IS THE ABOVE DESTINATION THE ONLY ONE (Y OR N)"
4000 LOCATE 6,52
4005 INPUT EAS
4010 LOCATE 8,52
4015 INPUT EBS
4020 LOCATE 10,61
4025 INPUT ECS
4030 LOCATE 12,52
4035 INPUT EDS
4040 LOCATE 14,61
4045 INPUT EES
4050 LOCATE 16,52
4055 INPUT EFS
4060 LOCATE 18,61
4065 INPUT EGS
4070 LOCATE 20,52
4075 INPUT EHS
4080 LOCATE 22,61
4085 INPUT EIS
4090 CLS
4095 LOCATE 4,9 :PRINT EAs" uses "EBS
4100 LOCATE 5,9 :PRINT EBS" used-by "EAs
4105 LOCATE 6,9 :PRINT EBS" produced-by "EAs
4110 LOCATE 7,9 :PRINT EDS" produces "EFS
4115 LOCATE 8,9 :PRINT EAS" produces "EFS
4120 LOCATE 9,9 :PRINT EFS" produced-by "EAs
4125 LOCATE 10,9 :PRINT EFS" received-by "EHS
4130 LOCATE 11,9 :PRINT EHS" receives "EFS
4135 LOCATE 12,9 :PRINT EAS" Is-a technological-activity"
4140 LOCATE 15,1 :PRINT "PRESS 1 IF ABOVE IS CORRECT AND THERE IS MORE DATA FOR
   THIS TECH-ACTIVITY"
4145 LOCATE 16,1 :PRINT "PRESS 2 IF ABOVE IS NOT CORRECT AND YOU WANT TO REENTER
   THE DATA"
4150 LOCATE 17,1 :PRINT "PRESS 3 IF ABOVE IS NOT CORRECT AND YOU DON’T WANT IT S
   AVOID AND TO EXIT"
4155 LOCATE 18,1 :PRINT "PRESS 4 IF ABOVE IS CORRECT AND THERE IS MORE DATA FOR
   A DIFFERENT TECH-ACTIVITY"
4160 LOCATE 19,1 :PRINT "PRESS 5 IF ABOVE IS CORRECT AND YOU WANT TO EXIT TO MEN U"
4165 LOCATE 22,1 :PRINT "ENTER YOUR CHOICE HERE ———>
4170 LOCATE 22,29
4175 INPUT EJS
4180 IF EJS = "1" GOTO 6065
4185 IF EJS = "2" GOTO 3590
4190 IF EJS = "3" GOTO 3480
4195 IF EJS = "4" GOTO 5100
4200 IF EJS = "5" GOTO 5105
4205 BEEP
4210 GOTO 4090
4215 IF ECS = "n" GOTO 4245
4220 IF ECS = "n" GOTO 4395
4225 IF ECS = "n" GOTO 4505
4230 IF EJS = "n" GOTO 4655
4235 BEEP
4240 GOTO 4090

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CLS
LOCATE 4, 20 : PRINT "WHAT OTHER INPUT IS USED BY "EAS"
LOCATE 6, 20 : PRINT " "
LOCATE 7, 20 : PRINT " !
LOCATE 8, 20 : PRINT " !
LOCATE 7, 24
LOCATE 11, 20 : PRINT "WHAT SOURCE PROVIDES "EKS"
LOCATE 12, 20 : PRINT " "
LOCATE 13, 20 : PRINT " !
LOCATE 14, 20 : PRINT " !
LOCATE 13, 24
LOCATE 15, 20 : PRINT "EKS " " supplied by "EVS"
LOCATE 16, 20 : PRINT "EKS " " supplied by "EVS"
LOCATE 9, 20 : PRINT "EAS " " uses "EKS"
LOCATE 10, 20 : PRINT "EKS " " used by "EAS"
LOCATE 18, 5 : PRINT "PRESS 1 IF THERE ARE ANY MORE INPUTS USED BY "EAS"
LOCATE 19, 5 : PRINT "PRESS 2 IF THE ABOVE IS INCORRECT AND YOU WANT TO REENTER THE DATA"
LOCATE 20, 5 : PRINT "PRESS 3 IF THERE ARE NO MORE INPUTS AND ABOVE SAVED"
LOCATE 21, 5 : PRINT "PRESS 4 IF ABOVE INCORRECT, NOT SAVED AND TO EXIT"
LOCATE 23, 5 : PRINT "ENTER YOUR CHOICE HERE ——>"
LOCATE 23, 33
LOCATE 15, 20 : PRINT "EKS" = "1" GOTO 5170
LOCATE 16, 20 : PRINT "EKS" = "2" GOTO 4245
LOCATE 17, 20 : PRINT "EKS" = "3" GOTO 5175
LOCATE 18, 20 : PRINT "EKS" = "4" GOTO 4220
LOCATE 20, 20 : PRINT "EBS"
LOCATE 4, 20 : PRINT "WHAT OTHER SOURCE PROVIDES "EBS"
LOCATE 6, 20 : PRINT " "
LOCATE 7, 20 : PRINT " !
LOCATE 8, 20 : PRINT " !
LOCATE 7, 24
LOCATE 10, 20 : PRINT "EBS" " supplied by "EVS"
LOCATE 11, 20 : PRINT "EBS" " supplied by "EVS"
LOCATE 18, 1 : PRINT "ENTER 1 IF ABOVE IS CORRECT AND THERE ARE NO MORE SOURCES"
LOCATE 19, 1 : PRINT "ENTER 2 IF ABOVE IS CORRECT AND THERE ARE MORE SOURCES PROVIDING "EBS"
LOCATE 20, 1 : PRINT "ENTER 3 IF ABOVE IS NOT CORRECT AND YOU WANT TO REENTER THE DATA"
LOCATE 21, 1 : PRINT "ENTER 4 IF ABOVE IS NOT CORRECT AND YOU DON'T WANT IT SAVED AND TO EXIT"
LOCATE 23, 20 : PRINT "ENTER YOUR CHOICE HERE ——>"
LOCATE 23, 48
LOCATE 15, 20 : PRINT "EBS" = "1" GOTO 5210
LOCATE 16, 20 : PRINT "EBS" = "2" GOTO 6215
LOCATE 17, 20 : PRINT "EBS" = "3" GOTO 4365
LOCATE 18, 20 : PRINT "EBS" = "4" GOTO 4225
4488 BEEP
4500 GOTO 4480
4505 CLS
4510 LOCATE 4, 20: PRINT "WHICH OTHER OUTPUTS ARE PRODUCED BY "EAS"
4515 LOCATE 6, 20: PRINT " "
4520 LOCATE 7, 20: PRINT "!"  
4525 LOCATE 8, 20: PRINT ""  
4530 LOCATE 7, 27
4535 INPUT E$ 
4540 LOCATE 10, 20: PRINT EAS " produces "E$ 
4545 LOCATE 11, 20: PRINT E$ " produced by "EAS 
4550 LOCATE 13, 20: PRINT "WHICH DESTINATION RECEIVES "E$ 
4555 LOCATE 14, 20: PRINT " " 
4560 LOCATE 15, 20: PRINT "!" 
4565 LOCATE 16, 20: PRINT "" 
4570 LOCATE 15, 27
4575 INPUT ECS
4580 LOCATE 17, 20: PRINT ECS " receives "E$ 
4585 LOCATE 18, 20: PRINT E$ " received by "ECS 
4590 LOCATE 19, 1: PRINT "ENTER 1 IF ABOVE IS CORRECT AND THERE ARE NO MORE OUTPUTS" 
4595 LOCATE 20, 1: PRINT "ENTER 2 IF ABOVE IS CORRECT AND THERE ARE MORE OUTPUTS" 
4600 LOCATE 21, 1: PRINT "ENTER 3 IF ABOVE IS INCORRECT AND YOU WANT TO REENTER THE DATA" 
4605 LOCATE 22, 1: PRINT "ENTER 4 IF ABOVE IS INCORRECT, NOT SAVED AND TO EXIT" 
4610 LOCATE 24, 20: PRINT "ENTER YOUR CHOICE HERE ————->" 
4615 LOCATE 23, 48
4620 INPUT E$ 
4625 IF E$ = "1" GOTO 5240 
4630 IF E$ = "2" GOTO 5245 
4635 IF E$ = "3" GOTO 4505 
4640 IF E$ = "4" GOTO 4230 
4645 BEEP
4650 GOTO 4610 
4655 CLS
4660 LOCATE 2, 20: PRINT "WHAT OTHER DESTINATION RECEIVES "E$ 
4665 LOCATE 4, 20: PRINT " " 
4670 LOCATE 5, 20: PRINT "!" 
4675 LOCATE 6, 20: PRINT "" 
4680 LOCATE 5, 24 
4685 INPUT E$ 
4690 LOCATE 7, 20: PRINT E$ " received by "E$ 
4695 LOCATE 8, 20: PRINT E$ " receives "E$ 
4700 LOCATE 18, 1: PRINT "ENTER 1 IF ABOVE IS CORRECT AND THERE ARE NO MORE DESTINATIONS" 
4705 LOCATE 19, 1: PRINT "ENTER 2 IF ABOVE IS CORRECT AND THERE ARE MORE DESTINATIONS" 
4710 LOCATE 20, 1: PRINT "ENTER 3 IF ABOVE IS NOT CORRECT AND YOU WANT TO REENTER THE DATA" 
4715 LOCATE 21, 1: PRINT "ENTER 4 IF ABOVE IS INCORRECT, NOT SAVED AND TO EXIT" 
4720 LOCATE 23, 20: PRINT "ENTER YOUR CHOICE HERE ————->" 
4725 LOCATE 23, 48 
4730 INPUT ETS 
4735 IF ETS = "1" GOTO 5280
4740 IF ETS = "2" GOTO 5225
4745 IF ETS = "3" GOTO 4855
4750 IF ETS = "4" GOTO 4080
4755 BEEP
4760 GOTO 4720
4765 LET H = 1 : GOTO 4780
4770 LET H = 2 : GOTO 4780
4775 LET H = 3 : GOTO 4780
4780 WRITE #1, ABS, TAS, ACS
4785 WRITE #1, ABS, TBS, TES
4790 WRITE #1, ABS, TZZS, ADS
4795 WRITE #1, ADS, TCS, ABS
4800 WRITE #1, ADS, TWS, TZZS
4805 IF H = 1 GOTO 1235
4810 IF H = 2 GOTO 1005
4815 IF H = 3 GOTO 905
4820 LET H = 4 : GOTO 4835
4825 LET H = 5 : GOTO 4835
4830 LET H = 6 : GOTO 4835
4835 WRITE #1, ABS, TCS, AF$.
4840 WRITE #1, AF$, TCS, AB$.
4845 WRITE #1, AF$, TBS, TES
4850 IF H = 4 GOTO 1235
4855 IF H = 5 GOTO 905
4860 IF H = 6 GOTO 1005
4865 LET H = 7 : GOTO 4880
4870 LET H = 8 : GOTO 4880
4875 LET H = 9 : GOTO 4880
4880 WRITE #1, AHS, TGS, AHS
4885 WRITE #1, AHS, TBS, AHS
4890 WRITE #1, AHS, TIS, AIS
4895 WRITE #1, AIS, TJS, AHS
4900 WRITE #1, AIS, TLS, AIS
4905 WRITE #1, AIS, TKS, AIS
4910 WRITE #1, AHS, TMS, AKS
4915 WRITE #1, AKS, TMS, AKS
4920 WRITE #1, AKS, TPS, ALS
4925 WRITE #1, ALS, TYS, AKS
4930 IF H = 7 GOTO 1730
4935 IF H = 8 GOTO 905
4940 IF H = 9 GOTO 1375
4945 LET H = 10 : GOTO 4880
4950 LET H = 11 : GOTO 4880
4955 LET H = 12 : GOTO 4880
4960 WRITE #1, ACS, TCS, APS
4965 WRITE #1, APS, TRS, ACS
4970 WRITE #1, APS, TIS, ACS
4975 WRITE #1, AQS, TJS, APS
4980 WRITE #1, AQS, TLS, ARS
4985 WRITE #1, AQS, TKS, ACS
4990 WRITE #1, APS, TMS, ASS
4995 WRITE #1, ASS, TNS, APS
5000 WRITE #1, ASS, TPS, ATS
5005 WRITE #1, ATS, TYS, ASS
5010 IF H = 10 GOTO 2222
5015 IF H = 11 GOTO 505  
5020 IF H = 12 GOTO 2275  
5025 LET K = 1 :GOTO 5035  
5030 LET K = 2 :GOTO 5035  
5035 WRITE #2, DAS, TGS, EES  
5040 WRITE #2, DAS, TGS, DAS  
5045 IF K = 1 GOTO 3535  
5050 IF K = 2 GOTO 3460  
5055 LET K = 3 :GOTO 5055  
5060 LET K = 4 :GOTO 5065  
5065 WRITE #2, FAS, TSS, FES  
5070 WRITE #2, FES, TSS, FAS  
5075 WRITE #2, FES, TSS, FCS  
5080 WRITE #2, FCS, TSS, FES  
5085 IF K = 3 GOTO 3720  
5090 IF K = 4 GOTO 3480  
5095 LET K = 5 :GOTO 5110  
5100 LET K = 6 :GOTO 5110  
5105 LET K = 7 :GOTO 5110  
5110 WRITE #2, EAS, TIS, EBS  
5115 WRITE #2, ESS, TJS, EAS  
5120 WRITE #2, EBS, TLS, EBS  
5125 WRITE #2, EDS, TKS, EBS  
5130 WRITE #2, EAS, TMS, EFS  
5135 WRITE #2, EFS, TNS, EAS  
5140 WRITE #2, EFS, TPS, EHS  
5145 WRITE #2, EHS, TYS, EFS  
5150 WRITE #2, EAS, TWS, TXS  
5155 IF K = 5 GOTO 4215  
5160 IF K = 6 GOTO 3880  
5165 IF K = 7 GOTO 3480  
5170 LET K = 8 :GOTO 5180  
5175 LET K = 9 :GOTO 5180  
5180 WRITE #2,eks, TLS, Ems  
5185 WRITE #2,EMS, TKS, EKS  
5190 WRITE #2, EAS, TIS, EKS  
5195 WRITE #2, EKS, TJS, EAS  
5200 IF K = 8 GOTO 4245  
5205 IF K = 9 GOTO 4220  
5210 LET K = 10 :GOTO 5220  
5215 LET K = 11 :GOTO 5220  
5220 WRITE #2, EBS, TLS, ENS  
5225 WRITE #2, ENS, TKS, EBS  
5230 IF K = 10 GOTO 4225  
5235 IF K = 11 GOTO 4395  
5240 LET K = 12 :GOTO 5250  
5245 LET K = 13 :GOTO 5250  
5250 WRITE #2, ESS, TYS, EPS  
5255 WRITE #2, EPS, TPS, EGS  
5260 WRITE #2, EAS, TMS, EPS  
5265 WRITE #2, EPS, TNS, EAS  
5270 IF K = 12 GOTO 4230  
5275 IF K = 13 GOTO 4535  
5280 LET K = 14 :GOTO 5290  
5285 LET K = 15 :GOTO 5350  

5555 LET K = 31 :GOTO 5570
5570 WRITE #1,ASS,TPS,RASS
5575 WRITE #1,RASS,TPS,ASS
5580 IF K = 30 GOTO 2455
5585 IF K = 31 GOTO 3060
5590 CLS
5595 LOCATE 6,20 :PRINT "EXAMINE A PREVIOUSLY ENTERED FILE MENU"
5600 LOCATE 6,20 :PRINT "ALL ORGANISATIONAL ENTITIES"
5605 LOCATE 8,19 :PRINT "[ 1] ALL THE ORGANISATIONAL ENTITIES"
5610 LOCATE 9,19 :PRINT "[ 2] ALL THE MAIN RULES"
5615 LOCATE 10,19 :PRINT "[ 3] WHAT A PARTICULAR MANAGER PERCEIVES"
5620 LOCATE 11,19 :PRINT "[ 4] WHAT A PARTICULAR MANAGER PERFORMS"
5625 LOCATE 12,19 :PRINT "[ 5] INPUTS & OUTPUTS FOR AN ACTIVITY OR FUNCTION"
5630 LOCATE 13,19 :PRINT "[ 6] ALL SOURCES FOR A SPECIFIC INPUT"
5635 LOCATE 14,19 :PRINT "[ 7] ALL DESTINATIONS FOR A SPECIFIC OUTPUT"
5640 LOCATE 15,19 :PRINT "[ 8] ALL ORG-ENTITIES BELONGING TO AN ORG-ENTITY"
5650 LOCATE 17,19 :PRINT "[ 10] WHAT AN ORG-ENTITY RECEIVES FROM OTHER ENTITIES"
5655 LOCATE 18,19 :PRINT "[ 11] WHAT AN ORG-ENTITY PRODUCES"
5660 LOCATE 19,19 :PRINT "[ 12] TO GO BACK TO MAIN MENU"
5665 LOCATE 23,19 :PRINT "ENTER YOUR CHOICE HERE --->":LOCATE 23,47
5670 INPUT RTTS
5675 IF RTTS = "1" GOTO 5755
5680 IF RTTS = "2" GOTO 5635
5685 IF RTTS = "3" GOTO 5575
5690 IF RTTS = "4" GOTO 5550
5695 IF RTTS = "5" GOTO 5025
5700 IF RTTS = "6" GOTO 5050
5705 IF RTTS = "7" GOTO 5025
5710 IF RTTS = "8" GOTO 5030
5715 IF RTTS = "9" GOTO 5740
5720 IF RTTS = "10" GOTO 6375
5725 IF RTTS = "11" GOTO 6455
5730 IF RTTS = "12" GOTO 345
5735 BEEP:GOTO 5590
5740 CLS
5745 CLOSE #1,#2
5750 OPEN FILES FCR INPUT AS #1 LEN=50
5755 INPUT #1,AS,BS,CS
5760 PRINT AS SPC(1) BS SPC(1) CS
5765 IF EOF(1) THEN CLOSE #1 ELSE GOTO 5755
5770 LOCATE 30:PRINT """""""""""""""
5775 LOCATE 30:PRINT "PRESS 'RETURN' KEY TO GO BACK TO MENU"
5780 LOCATE 48:INPUT RTTS
5785 LOCATE 48:INPUT RTXS
5788 IF RTTS = "1" THEN GOTO 6615 ELSE GOTO 5790
5790 GOTO 5590
5795 CLS
5800 CLOSE #1,#2
5805 OPEN FILES FCR INPUT AS #1 LEN=50
5810 INPUT #1,AS,BS,CS
5815 IF BS = "TZZS" THEN GOTO 5820 ELSE GOTO 5825
5820 PRINT AS
5825 IF EOF(1) THEN CLOSE #1 ELSE GOTO 5810
5830 GOTO 5770
8835 CLS
8840 CLOSE *1,*2
8845 OPEN FILES FOR INPUT AS *1 LEN=60
8850 INPUT *1,AS,BS,CS
8855 IF CS = T$ THEN GOTO 5860 ELSE GOTO 5865
8860 PRINT AS
8865 IF ECF(1) THEN CLOSE *1 ELSE GOTO 5865
8870 GOTO 6770
8875 CLOSE *1,*2
8880 OPEN FILES FOR INPUT AS *1 LEN=60
8885 CLS
8890 LOCATE 5,16 :PRINT "WHAT IS THE TITLE OF THE MANAGER YOU WISH TO LOOK AT?";
8895 LOCATE 6,16 :PRINT "________________________________________
8900 LOCATE 9,16 :PRINT "**
8905 LOCATE 10,16:PRINT "!**
8910 LOCATE 11,16:PRINT "**
8915 LOCATE 10,29:INPUT XRT$;
8920 CLS
8925 INPUT *1,AS,BS,CS
8930 IF AS = XRTS AND BS = T$ THEN GOTO 6826 ELSE GOTO 6840
8935 PRINT AS SPC(1) BS SPC(1) CS
8940 IF ECF(1) THEN CLOSE *1 ELSE GOTO 6825
8945 GOTO 6770
8950 CLOSE *1,*2
8955 OPEN FILES FOR INPUT AS *1 LEN=60
8960 CLS
8965 LOCATE 5,16 :PRINT "WHAT IS THE TITLE OF THE MANAGER YOU WISH TO LOOK AT?";
8970 LOCATE 6,16 :PRINT "________________________________________
8975 LOCATE 9,16 :PRINT "**
8980 LOCATE 10,16:PRINT "!**
8985 LOCATE 11,16:PRINT "**
8990 LOCATE 10,29:INPUT HITS;
8995 CLS
9000 INPUT *1,AS,BS,CS
9005 IF AS = HTS AND BS = T$ THEN GOTO 6810 ELSE GOTO 6815
9010 PRINT AS SPC(1) BS SPC(1) CS
9015 IF ECF(1) THEN CLOSE *1 ELSE GOTO 6800
9020 GOTO 6770
9025 CLS
9030 LOCATE 5,16 :PRINT "WHAT IS THE ACTIVITY OR FUNCTION YOU WISH TO LOOK AT?";
9035 LOCATE 6,16 :PRINT "________________________________________
9040 LOCATE 9,16 :PRINT "**
9045 LOCATE 10,16:PRINT "!**
9050 LOCATE 11,16:PRINT "**
9055 LOCATE 10,29:INPUT CHT$;
9060 CLS
9065 PRINT "INPUTS FOR "CHT$;
9070 PRINT "**
9075 CLOSE *1,*2
9080 OPEN FILES FOR INPUT AS *1 LEN=60
9085 INPUT *1,AS,BS,CS
9090 IF AS = CHTS AND BS = T$ THEN GOTO 6895 ELSE GOTO 6100
9095 PRINT C3
9100 IF ECF(1) THEN CLOSE *1 ELSE GOTO 6085
9105 PRINT "OUTPUTS FOR "CHTS
6110 PRINT "----------"
6115 CLOSE *1,*2
6120 OPEN FILES FOR INPUT AS #1 LEN=50
6125 INPUT #1,AS,BS,CS
6130 IF AS = CHTS AND BS = TMS THEN GOTO 6135 ELSE GOTO 6140
6135 PRINT CS
6140 IF EOF(1) THEN CLOSE #1 ELSE GOTO 6125
6145 GOTO 5770
6150 CLS
6155 LOCATE 6,16 :PRINT "WHICH INPUT DO YOU WISH TO SEE IT'S SOURCES"
6160 LOCATE 6,16 :PRINT "---------------------------"
6165 LOCATE 9,16 :PRINT ""  
6170 LOCATE 10,16:PRINT ""  
6175 LOCATE 11,16:PRINT ""  
6180 LOCATE 10,25:INPUT JJK$  
6185 CLOSE #1,*2
6190 OPEN FILES FOR INPUT AS #1 LEN=50
6195 CLS
6200 INPUT #1,AS,BS,CS  
6205 IF AS = JJK$ AND BS = TLS THEN GOTO 6210 ELSE GOTO 6215
6210 PRINT CS  
6215 IF EOF(1) THEN CLOSE #1 ELSE GOTO 6200
6220 GOTO 5770
6225 CLS
6230 LOCATE 5,13 :PRINT "WHICH OUTPUT DO YOU WISH TO SEE IT'S DESTINATIONS"
6235 LOCATE 6,16 :PRINT "-----------------------------"
6240 LOCATE 9,16 :PRINT ""  
6245 LOCATE 10,16:PRINT ""  
6250 LOCATE 11,16:PRINT ""  
6255 LOCATE 10,25:INPUT JRK$  
6260 CLOSE #1,*2
6265 OPEN FILES FOR INPUT AS #1 LEN=50
6270 CLS
6275 INPUT #1,AS,BS,CS
6280 IF AS = JRK$ AND BS = TPS THEN GOTO 6285 ELSE GOTO 6250
6285 PRINT CS
6290 IF EOF(1) THEN CLOSE #1 ELSE GOTO 6275
6295 GOTO 5770
6300 CLS
6305 LOCATE 5,13 :PRINT "WHICH ORG-ENTITY DO YOU WISH TO SEE IT'S SUB-ENTITIES"
6310 LOCATE 6,13 :PRINT "-----------------------------"
6315 LOCATE 9,13 :PRINT ""  
6320 LOCATE 10,13:PRINT ""  
6325 LOCATE 11,13:PRINT ""  
6330 LOCATE 10,29:INPUT GLLS  
6335 CLOSE #1,*2
6340 OPEN FILES FOR INPUT AS #1 LEN=50
6345 CLS
6350 INPUT #1,AS,BS,CS
6355 IF AS = GLLS AND BS = TCS THEN GOTO 6360 ELSE GOTO 6365
6360 PRINT CS  
6365 IF EOF(1) THEN CLOSE #1 ELSE GOTO 6350
6370 GOTO 5770
6375 CLS
6380 LOCATE 5,16 :PRINT "WHAT IS THE NAME OF THE ENTITY YOU WISH TO LOOK AT?"
6225 LOCATE 9,16:PRINT ""  
6230 LOCATE 10,16:PRINT ""  
6235 LOCATE 11,16:PRINT ""  
6400 LOCATE 10,29:INPUT TIT$  
6405 CLS  
6410 PRINT TIT$: "receives from other org-entities the following;"  
6415 CLOSE #1, #2  
6420 OPEN FILES FOR INPUT AS #1 LEN=50  
6425 INPUT #1, AS$, BS$, CS  
6430 IF AS = TIT$ AND BS = TYS THEN GOTO 6425 ELSE GOTO 6440  
6435 PRINT CS  
6440 IF ECF(1) THEN CLOSE #1 ELSE GOTO 6425  
6445 GOTO 5770  
6450 CLOSE #1  
6455 CLS  
6460 LOCATE 5,18:PRINT "WHAT IS THE NAME OF THE ENTITY YOU WISH TO LOOK AT;"  
6465 LOCATE 9,16:PRINT ""  
6470 LOCATE 10,16:PRINT ""  
6475 LOCATE 11,16:PRINT ""  
6480 LOCATE 10,29:INPUT TYT$  
6485 CLS  
6490 PRINT TYT$: "produces the following:"  
6495 OPEN FILES FOR INPUT AS #1 LEN=50  
6500 INPUT #1, AS$, BS$, CS  
6505 TZZ$ = "controlled-by"  
6510 IF AS = TYT$ AND BS = TZZ$ THEN GOTO 6525 ELSE GOTO 6515  
6515 IF ECF(1) THEN CLOSE #1 ELSE GOTO 6500  
6520 GOTO 5770  
6525 LET ASAS = CS  
6530 CLOSE #1  
6535 OPEN FILES FOR INPUT AS #1 LEN=50  
6540 INPUT #1, AS$, BS$, CS  
6545 TGS = "perceives"  
6550 TGS = "performs"  
6555 IF AS = ASAS AND BS = TGS THEN GOTO 6575 ELSE GOTO 6560  
6560 IF AS = ASAS AND BS = TGS THEN GOTO 6575 ELSE GOTO 6565  
6565 IF ECF(1) THEN CLOSE #1 ELSE GOTO 6540  
6570 GOTO 5770  
6575 LET AXAS = CS  
6580 INPUT #1, AS$, BS$, CS  
6585 TMS = "produces"  
6590 IF AS = AXAS AND BS = TMS THEN GOTO 6595 ELSE GOTO 6560  
6595 IF ECF(1) THEN CLOSE #1 ELSE GOTO 6550  
6600 PRINT CS  
6605 GOTO 6540  
6610 CLS: SYSTEM  
6615 CLS  
6620 LOCATE 4,15:PRINT "EXAMINE A FILE AND PROLOG PREPARATION MENU;"  
6625 LOCATE 5,15:PRINT ""  
6630 LOCATE 7,15:PRINT "[1] AN ORGANISATIONAL DATA MODEL FILE;"  
6635 LOCATE 8,15:PRINT "[2] A TECHNOLOGICAL DATA MODEL FILE;"  
6640 LOCATE 9,15:PRINT "[3] A MICRO-PROLOG PREPARED DATA FILE;"  
6645 LOCATE 10,15:PRINT "[4] TO PREPARE A PROLOG DATA FILE;"  
6650 LOCATE 11,15:PRINT "[5] TO GO BACK TO MAIN MENU;"  
6655 LOCATE 12,15:PRINT "ENTER YOUR CHOICE HERE ----->"
LOCATE 19, 15:PRINT "------------------------------------"
LOCATE 20, 15:PRINT "WARNING: PLACE YOUR DATA DISK IN CRIVE A"
LOCATE 21, 15:PRINT "BEFORE CONTINUING"
LOCATE 22, 15:PRINT "------------------------------------"
LOCATE 18, 43
INPUT MSG$:
IF MSG$ = "1" GOTO 6730
IF MSG$ = "2" GOTO 6730
IF MSG$ = "3" GOTO 6730
IF MSG$ = "4" GOTO 6730
IF MSG$ = "5" GOTO 340
BEEP : GOTO 6815
CLS
LOCATE 4, 15 :PRINT "WHAT IS THE NAME OF THE COM FILE YOU WISH TO EXAMINE?"
LOCATE 5, 15 :PRINT "--------------------------------------"
LOCATE 8, 15 :PRINT "ENTER HERE THE NAME -------->
LOCATE 14, 1 :PRINT "THE NAMES OF THE FILES THAT YOU ALREADY HAVE ARE:"
LOCATE 15, 1 :PRINT "--------------------------------------"
FILES
LOCATE 8, 43 : INPUT FILES:
GOTO 5590
CLS
LOCATE 4, 15 :PRINT "WHAT IS THE NAME OF THE TDM FILE YOU WISH TO EXAMINE?"
LOCATE 5, 15 :PRINT "--------------------------------------"
LOCATE 8, 15 :PRINT "ENTER HERE THE NAME -------->
LOCATE 14, 1 :PRINT "THE NAMES OF THE FILES THAT YOU ALREADY HAVE ARE:"
LOCATE 15, 1 :PRINT "--------------------------------------"
FILES
LOCATE 8, 43 : INPUT FILES:
GOTO 8200
CLS
LOCATE 4, 15 :PRINT "WHAT IS THE NAME OF THE MICRO-PLOG FILE?"
LOCATE 5, 15 :PRINT "--------------------------------------"
LOCATE 8, 15 :PRINT "ENTER HERE THE NAME -------->
LOCATE 14, 1 :PRINT "THE NAMES OF THE FILES THAT YOU ALREADY HAVE ARE:"
LOCATE 15, 1 :PRINT "--------------------------------------"
FILES
LOCATE 8, 43 : INPUT FILES:
UITYGS = "1"
GOTO 5740
CLS
LOCATE 2, 15 :PRINT "GIVE ME TWO NAMES: THE FIRST IS THE NAME TO BE"
LOCATE 3, 15 :PRINT "USED TO NAME YOUR NEW MICRO-PLOG DATA FILE"
LOCATE 4, 15 :PRINT "AND THE SECOND NAME FOR THE FILE TO READ FROM."
LOCATE 5, 15 :PRINT "THE FIRST NAME SHOULD HAVE 1 - 5 CHARACTERS"
LOCATE 6, 15 :PRINT "AND THE FIRST NAME FOLLOWED BY .LOG : FOR EXAMPLE PDL.CG"
LOCATE 8, 15 :PRINT "ENTER FIRST NAME HERE -------->
LOCATE 14, 1 :PRINT "THE NAMES OF THE FILES THAT YOU ALREADY HAVE ARE:"
LOCATE 15, 1 :PRINT "--------------------------------------"
FILES
LOCATE 8, 43 : INPUT OFILES:
LOCATE 9, 15 :PRINT "ENTER SECOND NAME HERE -------->
LOCATE 9, 43 : INPUT INFILES:
GOTO 6838
CLS
LOCATE 4,15 :PRINT "GIVE ME FIVE CHARACTERS FOLLOWED BY .LOG"
LOCATE 5,15 :PRINT "IN ORDER TO NAME YOUR MICRO-FROLOG FILE"
LOCATE 6,15 :PRINT "FOR EXAMPLE: TYPE ---->TRACK,LOG"
LOCATE 8,15 :PRINT "ENTER HERE THE NAME --->"
LOCATE 14,1 :PRINT "THE NAMES OF THE FILES THAT YOU ALREADY HAVE ARE:
LOCATE 15,1 :PRINT "---------------------------------------------------------------------"
LOCATE 8,43 :INPUT FILES
GOTO 6850
CLS
OPEN INFILES FOR INPUT AS #1 LEN=50
OPEN OUTFILES FOR OUTPUT AS #3 LEN=50
INPUT #1,AS,BS,CS
IF BS = TWS THEN GOTO 6891 ELSE GOTO 6832
PRINT #3,LCES,BS,LOAS,AS,LOAS,CS,LCSS
IF ECF(1) THEN CLOSE #1 ELSE GOTO 6889
OPEN INFILES FOR INPUT AS #1 LEN=50
INPUT #1,AS,BS,CS
IF BS = TES THEN GOTO 6915 ELSE GOTO 6920
PRINT #3,LCES,BS,LOAS,AS,LOAS,CS,LCSS
IF ECF(1) THEN CLOSE #1 ELSE GOTO 6955
OPEN INFILES FOR INPUT AS #1 LEN=50
INPUT #1,AS,BS,CS
IF BS = TGS THEN GOTO 6985 ELSE GOTO 6970
PRINT #3,LCES,BS,LOAS,AS,LOAS,CS,LCSS
IF ECF(1) THEN CLOSE #1 ELSE GOTO 6955
OPEN INFILES FOR INPUT AS #1 LEN=50
INPUT #1,AS,BS,CS
IF BS = TZZS THEN GOTO 6990 ELSE GOTO 6995
PRINT #3,LCES,BS,LOAS,AS,LOAS,CS,LCSS
IF ECF(1) THEN CLOSE #1 ELSE GOTO 6980
OPEN INFILES FOR INPUT AS #1 LEN=50
INPUT #1,AS,BS,CS
IF BS = TCG THEN GOTO 7015 ELSE GOTO 7020
PRINT #3,LCES,BS,LOAS,AS,LOAS,CS,LCSS
IF ECF(1) THEN CLOSE #1 ELSE GOTO 7005
OPEN INFILES FOR INPUT AS #1 LEN=50
INPUT #1,AS,BS,CS
IF BS = TCG THEN GOTO 7040 ELSE GOTO 7045
PRINT #3,LCES,BS,LOAS,AS,LOAS,CS,LCSS
IF ECF(1) THEN CLOSE #1 ELSE GOTO 7030
OPEN INFILES FOR INPUT AS #1 LEN=50
INPUT #1,AS,BS,CS
IF BS = TMS THEN GOTO 7065 ELSE GOTO 7070
PRINT #3,LCES,BS,LOAS,AS,LOAS,CS,LCSS
IF ECF(1) THEN CLOSE #1 ELSE GOTO 7055
OPEN INFILES FOR INPUT AS #1 LEN=50
INPUT #1,AS,BS,CS
IF BS = TCG THEN GOTO 7095 ELSE GOTO 7095
7050 PRINT #3, LCE$; B$; LCA$; AS$; LCA$; CS$; LCO$S
7055 IF ECF(1) THEN CLOSE #1 ELSE GOTO 7050
7100 OPEN INFILES FOR INPUT AS #1 LEN=60
7105 INPUT #1, AS$, BS$, CS
7110 IF BS$ = TR$ THEN GOTO 7115 ELSE GOTO 7120
7115 PRINT #3, LCE$; B$; LCA$; AS$; LCA$; CS$; LCO$S
7120 IF ECF(1) THEN CLOSE #1 ELSE GOTO 7105
7125 OPEN INFILES FOR INPUT AS #1 LEN=60
7130 INPUT #1, AS$, BS$, CS
7135 IF BS$ = TR$ THEN GOTO 7140 ELSE GOTO 7145
7140 PRINT #3, LCE$; B$; LCA$; AS$; LCA$; CS$; LCO$S
7145 IF ECF(1) THEN CLOSE #1 ELSE GOTO 7130
7150 OPEN INFILES FOR INPUT AS #1 LEN=60
7155 INPUT #1, AS$, BS$, CS
7160 IF BS$ = TR$ THEN GOTO 7165 ELSE GOTO 7170
7165 PRINT #3, LCE$; B$; LCA$; AS$; LCA$; CS$; LCO$S
7170 IF ECF(1) THEN CLOSE #1 ELSE GOTO 7165
7175 OPEN INFILES FOR INPUT AS #1 LEN=60
7180 INPUT #1, AS$, BS$, CS
7185 IF BS$ = TR$ THEN GOTO 7180 ELSE GOTO 7185
7190 PRINT #3, LCE$; B$; LCA$; AS$; LCA$; CS$; LCO$S
7195 IF ECF(1) THEN CLOSE #1 ELSE GOTO 7180
7200 OPEN INFILES FOR INPUT AS #1 LEN=60
7205 INPUT #1, AS$, BS$, CS
7210 IF BS$ = TR$ THEN GOTO 7215 ELSE GOTO 7220
7215 PRINT #3, LCE$; B$; LCA$; AS$; LCA$; CS$; LCO$S
7220 IF ECF(1) THEN CLOSE #1 ELSE GOTO 7220
7225 OPEN INFILES FOR INPUT AS #1 LEN=60
7230 INPUT #1, AS$, BS$, CS
7235 IF BS$ = TR$ THEN GOTO 7240 ELSE GOTO 7245
7240 PRINT #3, LCE$; B$; LCA$; AS$; LCA$; CS$; LCO$S
7245 IF ECF(1) THEN CLOSE #1 ELSE GOTO 7230
7250 OPEN INFILES FOR INPUT AS #1 LEN=60
7255 INPUT #1, AS$, BS$, CS
7260 IF BS$ = TR$ THEN GOTO 7265 ELSE GOTO 7270
7265 PRINT #3, LCE$; B$; LCA$; AS$; LCA$; CS$; LCO$S
7270 IF ECF(1) THEN CLOSE #1 ELSE GOTO 7265
7275 OPEN INFILES FOR INPUT AS #1 LEN=60
7279 INPUT #1, AS$, BS$, CS
7280 IF BS$ = TR$ THEN GOTO 7285 ELSE GOTO 7290
7285 PRINT #3, LCE$; B$; LCA$; AS$; LCA$; CS$; LCO$S
7290 IF ECF(1) THEN CLOSE #1 ELSE GOTO 7289
7295 OPEN INFILES FOR INPUT AS #1 LEN=60
7299 INPUT #1, AS$, BS$, CS
7300 IF BS$ = TR$ THEN GOTO 7305 ELSE GOTO 7320
7305 PRINT #3, LCE$; B$; LCA$; AS$; LCA$; CS$; LCO$S
7320 IF ECF(1) THEN CLOSE #1 ELSE GOTO 7320
7325 PRINT #3, LCE$; LCE$; LCA$; TWS$; TWS$; LCA$; LCA$; LCO$S
7400 PRINT #3, LCE$; LCE$; LCA$; TWS$; TWS$; LCA$; LCA$; LCO$S
7405 PRINT #3, LCE$; LCE$; LCA$; TWS$; TWS$; LCA$; LCA$; LCO$S
7410 PRINT #3, LCE$; LCE$; LCA$; TWS$; TWS$; LCA$; LCA$; LCO$S
7415 PRINT #3, LCE$; LCE$; LCA$; LCA$; TWS$; TWS$; LCA$; LCA$; LCO$S
7420 PRINT #3, LCE$; LCE$; LCA$; TWS$; LCA$; LCA$; LCO$S
7425 PRINT #3, LCE$; LCE$; LCA$; LCA$; TWS$; LCA$; LCA$; LCO$S
7430 PRINT #3, LCE$; LCE$; LCA$; TWS$; LCA$; LCA$; LCO$S

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7435 PRINT #3, LCES: LCBS: LOAS: TCS: LCSS: LCAS: LCAS
7440 PRINT #3, LCES: LCBS: LOAS: TRS: LCSS: LCAS: LCAS
7445 PRINT #3, LCES: LCBS: LOAS: TMS: LCSS: LCAS: LCAS
7450 PRINT #3, LCES: LCBS: LOAS: TS: LCSS: LCAS: LCAS
7455 PRINT #3, LCES: LCBS: LOAS: TK: LCSS: LCAS: LCAS
7460 PRINT #3, LCES: LCBS: LOAS: TLS: LCSS: LCAS: LCAS
7465 PRINT #3, LCES: LCBS: LOAS: TYS: LCSS: LCAS: LCAS
7470 PRINT #3, LCES: LCBS: LOAS: TPS: LCSS: LCAS: LCAS
7475 PRINT #3, LCES: LCBS: LOAS: TIS: LCSS: LCAS: LCAS
7480 PRINT #3, LCES: LCBS: LOAS: TJS: LCSS: LCAS: LCAS
7485 PRINT #3, LCES: LCBS: LOAS: TWS: LCSS: LCAS: LCAS
7500 PRINT #3, LCES: LCBS: LOAS: TES: LCSS: LCAS: LCAS
7505 PRINT #3, LCES: LCBS: LOAS: TGS: LCSS: LCAS: LCAS
7510 PRINT #3, LCES: LCBS: LOAS: TDS: LCSS: LCAS: LCAS
7515 PRINT #3, LCES: LCBS: LOAS: TZZS: LCSS: LOAS: LOAS
7520 PRINT #3, LCES: LCBS: LOAS: TGS: LCSS: LOAS: LOAS
7525 PRINT #3, LCES: LCBS: LOAS: TGS: LCSS: LOAS: LOAS
7530 PRINT #3, LCES: LCBS: LOAS: TGS: LCSS: LOAS: LOAS
7535 PRINT #3, LCES: LCBS: LOAS: TGS: LCSS: LOAS: LOAS
7540 PRINT #3, LCES: LCBS: LOAS: TGS: LCSS: LOAS: LOAS
7545 PRINT #3, LCES: LCBS: LOAS: TGS: LCSS: LOAS: LOAS
7550 PRINT #3, LCES: LCBS: LOAS: TGS: LCSS: LOAS: LOAS
7555 PRINT #3, LCES: LCBS: LOAS: TGS: LCSS: LOAS: LOAS
7560 PRINT #3, LCES: LCBS: LOAS: TGS: LCSS: LOAS: LOAS
7565 PRINT #3, LCES: LCBS: LOAS: TGS: LCSS: LOAS: LOAS
7570 PRINT #3, LCES: LCBS: LOAS: TGS: LCSS: LOAS: LOAS
7575 PRINT #3, LCES: LCBS: LOAS: TGS: LCSS: LOAS: LOAS
7580 PRINT #3, LCES: LCBS: LOAS: TJS: LCSS: LCAS: LCAS
8020 CLOSE #3
8025 CLS
8030 LOCATE 4, 15 : PRINT "----------------------------------------------------------------------------------------------------"
8035 LOCATE 5, 15 : PRINT "A MICRO-PROLOG FILE HAS BEEN PREPARED FOR YOU"
8040 LOCATE 6, 15 : PRINT "ON THE DATA DISK IN THE NAME OF "CPUFILES"
8045 LOCATE 7, 15 : PRINT "PRESS RETURN KEY TO GO BACK TO PREVIOUS MENU"
8050 LOCATE 8, 15 : PRINT "----------------------------------------------------------------------------------------------------"
8055 LOCATE 10, 37 : INPUT MICRTS
8060 GOTO 6615
8200 CLS
8205 LOCATE 5, 15 : PRINT "SORRY...THIS IS NOT READY YET; PRESS RETURN TO GO BACK TO MENU"
8210 LOCATE 6, 50 : INPUT NOTREADYS
8215 GOTO 6615
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APPENDIX D

THE MYERS-BRIGGS TYPE INDICATOR
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APPENDIX E

THE STATE-TRAIT ANXIETY INVENTORY
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APPENDIX F
THE PERSONAL STRAIN QUESTIONNAIRE
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APPENDIX G

COMPANY 'B' PROLOG STATEMENTS
((receives production-director gas-weekly-forward-load))
((receives despatch-foreman gas-weekly-forward-load))
((receives gas-foreman gas-weekly-forward-load))
((receives general-manager gas-weekly-forward-load))
((receives gas-production-manager gas-weekly-forward-load))
((receives gas-foreman gas-production-directly))
((receives despatch-foreman gas-despatch-coordination))
((receives accounting-dept status-of-gas-invoices))
((receives gas-purchasing-manager gas-stock-order))
((receives gas-production-manager order-intake-sheet))
((receives gas-foreman gas-manufacturing-order))
((receives gas-purchasing-manager gas-manufacturing-order-1))
((receives despatch-foreman gas-manufacturing-order-2))
((receives accounts-dept gas-manufacturing-order-3))
((receives gas-customer gas-manufacturing-order-4))
((receives stores gas-manufacturing-order-5))
((receives despatch-foreman gas-stock-order))
((receives accounts-dept gas-stock-order))
((receives gas-customer gas-stock-order))
((receives stores gas-stock-order))
((receives gas-supplier gas-purchase-order))
((receives stores gas-purchase-order))
((receives gas-purchasing-manager gas-stock-status))
((receives managing-director weekly-gas-stock-of-bars))
((receives general-manager week-gas-stock-of-bars))
((receives general-manager gas-month-material-usage))
((receives gas-supplier gas-purchase-visit))
((receives general-manager gas-costing-exercise))
((receives gas-estimating-manager new-gas-price-cost-list))
((receives gas-planning-dept contract-delegation-work))
((receives gas-estimating-manager pricing-strategy))
((receives gas-architect gas-contract-design))
((receives gas-customer gas-delivery-promise))
((receives gas-planning-manager gas-schedule-status))
((receives gas-customer gas-cont-delivery-status))
((receives gas-customer sales-tech-solution))
((receives gas-production-manager gas-production-priority))
((receives gas-gas-new-product-design))
((receives general-manager gas-contract-status))
((receives general-manager gas-contract-problems))
((receives gas-sawing-dept gas-cutting-sheet))
((receives gas-purchasing-manager gas-setting-out-sheet-1))
((receives gas-foreman gas-setting-out-sheet-2))
((receives despatch-foreman gas-setting-out-sheet-3))
((receives accounts-dept gas-setting-out-sheet-4))
((receives gas-architect gas-setting-out-sheet-5))
((receives gas-customer gas-quotation))
((receives managing-director gas-acts-won-monthly))
((receives managing-director gas-order-intake-by-prod))
((receives managing-director gas-quot-revd- &-quoted))
((receives managing-director gas-forward-load-analysis))
((receives managing-director gas-margins-set))
((receives managing-director gas-market-status))
((receives financial-director gas-trends))
((receives financial-director gas-potential-bad-debt))