The University of Aston in Birmingham

Title The Role of Experience in Management Decision Making

Course M.Sc. in Applied Psychology

Name Jeremy John Ridge

Year 1970 Month October

Degree awards at Aston University

The following degrees will be awarded today at the Aston University degree congregation:

Engineering

MECHANICAL ENGINEERING

Doctor of Philosophy: C. G. Watson. **Master of Science by Course (Mechanical Engineering Design):** R. Gallup; J. L. Gordon; D. J. Hughes; C. G. Lloyd. In absentia: T. S. Chennabasavan; C. Y. Lai. **Master of Science by Course (Mechanics of Solids):** H. Al-Saadawi; B. D. Barrows; P. Ng; W. S. Sze. In absentia: N. T. Bott; A. E. Mejia; S. K. Roy; J. D. Whitehouse. **Bachelor of Science (Sandwich Course) Honours, Class I:** J. Cuckson; M. Douglas; A. R. Green; R. E. Jones; M. P. Morris; C. A. M. Soares; W. R. Rennison; T. A. Sanderson. **Honours, Class II, Division ii:** P. Applin; D. J. Brown; M. J. Butler; H. Coie; G. E. Goodwin; C. C. Jones; I. P. Lambert; D. C. Larner; A. C. Meadows; M. A. Newman; P. A. Skidmore; M. J. Wallis; C. R. West. **Honours, Class Division** P. Applin; R. G. Barratt; T. G. Bullock; W. A. Cherry; C. Daniels; R. J. Faithfull; P. E. Fitzgerald; R. O. Fox; M. K. Glover; M. Hughes; S. D. Jelfs; W. H. Large; R. T. Milner; R. A. Riley; D. A. Rogers; D. P. Upton; R. P. Walters. **Pass:** J. C. Betley; M. E. Higgs; P. J. Ravenscroft; G. Whitehurst; D. J. Wilcock. In absentia. **Honours, Class I:** T. R. H. Cressell. **Honours, Class II, Division i:** R. A. Jupp; C. A. Wilson. **Honours, Class II, Division ii:** M. J. W. Dandy; R. J. Joynes. **Pass:** S. C. T. Goh. **Bachelor of Science, Honours, Class II, Division i:** G. Jones; S. F. Ludwig; M. McDonald; R. R. Pugh. **Honours, Class II, Division ii:** M. C. Carnall; R. Green; J. T. D. Nicklin. **Pass:** R. A. Beck; J. Mayell; G. Murphy; J. M. Page; S. J. Roberts; T. Siegel; B. D. Weaver. **Aegrotat:** J. M. Gartside. In absentia. **Honours, Class II, Division ii:** P. J. Morgan. **Pass:** R. A. Bishop. **Bachelor of Science ad eundem gradum.** In absentia: A. Papantonopoulos.

METALLURGY

Doctor of Philosophy: A. J. Brown; E. A. Culpan; R. W. Durman. **Master of Science by Research:** P. Young. **Master of Science by Course (Industrial Metallurgy and Management Techniques):** I. L. Cooper; M. S. Devgun.

PRODUCTION ENGINEERING

Master of Science by Research in absentia: F. Shu Chan; K. B. Nair. **Bachelor of Science (Sandwich Course) Honours, Class I:** F. J. Morbey; A. M. Roberts. **Honours, Class II Division I:** P. H. Hunter; J. B. Morrell; M. E. Parrock; G. M. O. Price. **Honours, Class II Division II:** T. J. Clark; M. G. Cutler; B. M. Hooper; J. R. Maries; R. R. Throp; R. B. Vyse; B. G. Wilden; D. Wood. In absentia: **Honours, Class II Division II:** A. R. Godbole; J. C. Greenwood; G. W. Drinkwater; J. G. Eacott; D. S. Edwards; C. C. Egarr; J. Exon; R. Keal; G. W. Rhodes. In absentia: **P. J. Cunningham; C. D. Damle; R. Kant; A. J. Morris. Master of Science by Course (Technology of Engineering Materials):** L. M. Carnell; R. S. Lomas. In absentia: T. Marlow; C. J. Rhodes. **Bachelor of Science (Sandwich Course) Honours, Class II Division II:** F. A. Still; C. A. Stone. **Degree of Bachelor of Science ad eundem gradum: K. Garbett. Bachelor of Science Honours, Class I:** D. A. Scrimshire. **Honours, Class II Division I:** W. B. Donaldson; W. M. Donaldson; M. Jacobs. **Honours, Class II Division II:** G. R. Anderson; P. J. Pothecary; J. R. Shirtliff. **Pass:** K. K. Jain. In absentia: **Honours, Class II Division II:** P. N. Thong. **Pass:** M. J. Cunniffe; J. O. S. Ogundare.

ARCHITECTURE

Bachelor of Science: In absentia: **Pass:** D. A. Hall.

BUILDING

Master of Science by Research: R. Holmes. **Bachelor of Science (Environmental Health) Pass:** A. J. Pickles. In absentia: **Honours, Class II Division II:** M. R. Hall. **Pass:** R. D. Brogden.

CHEMICAL ENGINEERING

Doctor of Philosophy: J. Costello; C. J. Mumford. **Master of Science by Course (Process Analysis and Development):** J. R. Irani; J. S. Shayegan; L. R. Templeton. In absentia: A. A. Chaudhry; A. Prasertwitayakij; A. C. Salces; N. S. Suri; R. Wachs. **Bachelor of Science Honours, Class I:** D. O. Bizley; J. F. Hopkins; N. V. Mackley; D. L. T. Terry. **Honours, Class II Division I:** D. R. Arnold; P. R. Hart; J. B. Holland; A. James; B. Lingard; D. J. Rout; B. M. Sansom; D. B. Smith; R. J. Webb. **Honours, Class II Division II:** J. R. Aston; P. Durber; S. J. Kirk; M. G. Lloyd. **Pass:** D. R. F. Jenkinson. In absentia: **Honours, Class II Division II:** I. D. Burton; R. Davies. **Pass:** V. Mastorakis.

CIVIL ENGINEERING

Master of Science by Course (Design of Foundation and Structure): F. A. L. Ahmed; C. R. Ariathurai; P. B. Ronan; J. S. Sidhu. In absentia: M. Alavi. **Bachelor of Science Honours, Class II Division I:** J. S. Rastall. **Honours, Class II Division II:** J. R. Warner.

ELECTRICAL ENGINEERING

Master of Science by Research: J. Hamilton. **Master of Science by Course (Control Systems):** M. Steel. **Master of Science by Course (Precision Measurement and Instrumentation):** P. M. Ash; T. N. Seth. **Master of Science by Course (Design of Pulse and Digital Circuits and Systems):** D. F. Gray; D. D. Harrison; A. H. Rabone; K. T. Stephenson; V. C. Sweet. **Bachelor of Science (Sandwich Course) Honours, Class I:** B. A. Farey; A. M. Glass; M. A. Glen; J. M. Green; E. D. Jones. R. H. Lloyd; M. Norman; J. C. K. Sharp; K. G. Whitehouse. **Honours, Class II Division I:** K. Alderson. R. V. Boughton; K. Boydon; P. R. Challenor; R. B. Davis; M. J. Doughty; P. B. Gamble; R. Gilbert; D. Goodman; P. Harrison; A. M. Hopkins; D. G. Hopkins; L. J. Leonard; M. B. Norton; R. T. Payne; P. M. Starmer; P. D. Tarmey; M. E. Wood. **Honours, Class II Division II:** D. A. S. Bales; D. C. Chaddock; R. J. Collins; C. W. Davis; V. Fitzpatrick; P. J. Hadley; J. D. Holderfi J. K. Jones; K. Jones; D. Johnson; J. V. Kirwan; J. Lawrence; P. C. Managhan; C. M. Markiew; D. E. Reeve; K. Wilson. **Pass:** B. J. Attwood; F. Clewlow; D. J. Humphries. **Ordinary:** P. L. Beynon; J. M. Dalton; J. Elvery; C. R. Ford (with merit); P. W. Gunningham; J. Heiron; S. M. Jackson. In absentia: **Honours, Class II Division I:** D. S. Hopper; R. N. New. **Bachelor of Science Honours, Class I:** S. A. C. Sanders; R. Wilkinson. **Honours, Class II Division I:** G. Billis; M. R. Charlton; M. Saucede; D. F. Thomas. **Honours, Class II, Division II:** B. Blessed; S. Mansell; J. M. Muldoon; A. J. Swainsbury; P. N. Tayal; T. P. Wright. **Pass:** J. N. Anakor; J. R. Brightman; T. M. Guest; C. A. J. May; J. M. Thompson; D. C. Willetts. **Ordinary:** D. A. Heyward; H. G. Maxwell; E. C. D. Zinyohwera. In absentia: **Honours, Class II Division II:** H. Lee.

TOWN PLANNING

Bachelor of Science Honours, Class II, Division I: D. K. Foster; P. M. Myhill. **Honours, Class II, Division II:** A. S. Blake; J. R. Sherwood. **Pass:** J. A. Curnock.

Science

MATHEMATICS

Doctor of Philosophy: A. R. Stuart. **Master of Science by Course (Industrial Mathematics and Statistics):** D. S. Ubhi. In absentia: C. Coucoulas, F. W. Sharman. **Bachelor of Science (technological Mathematics) Honours, Class I:** M. C. Burton, C. R. Forsey, D. F. Roscoe, J. J. Tailford. **Honours, Class II division I:** G. R. Slater. **Honours, Class I division II:** G. M. Baynes, G. A. Cooper, N. R. Moulsdale, J. W. Richardson. In absentia: **Ordinary:** T. J. Stevens.

OPHTHALMIC OPTICS

Master of Science by Research: R. Targett. **Master of Science by Course (Methods of Ophthalmic Investigation):** J. H. C. Budd, H. P. Entlwistle, R. M. Green, B. Hitchin, S. C. Sharma, M. N. Watts. **Bachelor of Science Honours, Class III:** Y. V. A. Lewis. In absentia: **Pass:** A. M. Raines. **Aegrotat:** S. H. Blacklock.

PHARMACY

Doctor of Philosophy: J. S. Dowrick, C. G. Sparkes. In absentia: J. F. Harper. **Master of Science by Research:** in absentia: M. T. Umar.

PHYSICS

Doctor of Philosophy: R. J. Cruickshank, A. G. James, G. E. Keyte, B. J. Tymons. **Master of Science by Course (Physical Methods of Analysis):** B. E. Babakhan, K. B. Higgs, R. L. McConville, P. J. Wise. In absentia: T. Tunkasiri. **Master of Science by Course (Nuclear Reactor Technology):** T. D. A. Kennedy. In absentia: J. J. De Kock, E. W. Hesse, M. A. Khan, D. M. Parkinson, J. F. Siebert, P. W. Stark, A. M. Venter, J. H. Venter.

BIOLOGICAL SCIENCES

Doctor of Philosophy: R. J. Davies. In absentia: K. A. Malik. **Master of Science by Research:** D. D. Jones.

CHEMISTRY

Doctor of Philosophy: M. C. Cooke, M. Gilbert, E. D. Harvey, R. D. Laundon, D. G. Thwaite, J. I. Wright. **Master of Science by Research:** J. C. Paxton. In absentia: D. W. Snaith. **Master of Science by Course (Chemistry and Technology of Polymers):** J. W. Ayre, B. L. Brookshaw, A. Davies, A. L. Gregory, V. E. Keeley, A. M. G. Law, S. P. Low, C. O. Ng, W. G. A. O'Donnell, A. B. Paterson, A. Rawlinson, G. Varathungarajan. In absentia: G. N. Rowley. **Bachelor of Science (Sandwich Course):** In absentia **Honours, Class I:** F. A. A. Ingham. **Bachelor of Science Honours, Class II division ii:** C. M. Chandler. In absentia: **Honours, Class III:** K. V. Smith.

Social Science

APPLIED PSYCHOLOGY

Master of Science by Research: In absentia: J. A. Callister. **Master of Science by Course (Applied Psychology):** A. P. C. Atkinson, K. Greenhalgh, J. D. F. Harradence, A. Kriss, D. R. Lawrence, M. E. B. Lloyd, M. R. H. Page, J. J. Ridge. In absentia: H. D. Kijanski, M. W. Lee, A. Martindale, R. H. Moll.

EDUCATION

Master of Science by Research: G. H. Hughes.

INDUSTRIAL ADMINISTRATION

Master of Science by Research: In absentia: W. J. Williams. **Master of Science by Course (Industrial Administration):** J. Hudman. In absentia: W. F. Brown. **Master of Science by Course (Systems Analysis):** R. J. Gregory, M. M. Kanbury, S. F. Kassam, J. S. Saunders, A. Singer. **Bachelor of Science (Behavioural Science) Honours, Class II Division ii:** D. Mylan. **Ordinary.** L. M. Haman. In absentia: **Honours, Class II division ii:** T. Cowell. **Pass:** R. J. Perry.

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ADVANCED ELECTRICAL MACHINES TECHNOLOGY

G. F. H. Allen; R. J. Arnold; R. G. Courtney; R. W. Roope; R. S. Sinclair.

Diplomas

DEPARTMENT OF BUILDING

National Federation of Building Trade Employers Prize: P. G. Elliott; N. V. Moore. **John Rodgers Prize:** D. W. Smith.

DEPARTMENT OF CHEMICAL ENGINEERING

West Midlands Gas Board Prize: D. O. Bizley.

DEPARTMENT OF CIVIL ENGINEERING

Howard Hicks Prize: R. W. Vale. **James Carrington Prize:** M. R. Phillips.

DEPARTMENT OF ELECTRICAL ENGINEERING

Institution of Electrical Engineers Prize: J. C. K. Sharp. **Professor May Memorial Prize:** D. F. Thomas. **Griffiths Memorial Prize:** C. T. J. Younge.

DEPARTMENT OF MATHEMATICS

Leslie Wickert Memorial Prize: M. C. Burton; R. Smith.

DEPARTMENT OF PHARMACY

Boots Pure Drug Co. Ltd. Prize: E. J. Dania; H. E. Krygier; J. R. Traynor; K. A. Wilson. **Evans Medical Prize:** J. Fisher; K. R. Minchin. **I.C.I. Pharmaceutical Division Prize:** J. Stevens. **John Priestman Memorial Prize:** G. Cooper; D. Watson; S. A. Wharton. **Birmingham Branch of the Pharmaceutical Society Prize:** A. F. Clark; P. Lee; L. J. Stockley. **Pfizer Ltd. Prize:** A. G. Clarkson. **D. J. Rushton Prize:** P. A. Wills. **United Birmingham Hospitals Prize:** S. Pridgeon. **Bellamy and Wakefield Ltd. Prize:** D. D. Shah. **Harry Jones Prize:** O. Dobson; D. A. McNeill. **Gerrard Medal:** J. R. Traynor.

DEPARTMENT OF PHYSICS

Humphrey Orwin Memorial Prize: M. Lord; S. T. E. Roddis. **Dr. Sumpner Prize:** D. M. Cooper. **Imperial Metal Industries Ltd. Prize:** J. M. Walls. **Dunlop Rubber Co. Ltd. Prize:** K. J. Campbell.

DEPARTMENT OF MECHANICAL ENGINEERING

Birmingham Small Arms Ltd. Prize: J. Cuckson. **Essery Memorial Prize (Undergraduate):** M. Douglas. **Essery Memorial Prize (Postgraduate):** D. J. Hughes. **Thomas Reid Memorial Prize:** T. R. H. Cressell. **Imperial Metal Industries Ltd. Prize:** W. R. Rennison. **Dunlop Rubber Co. Prize:** T. A. Sanderson. **Keith Perkins Memorial Prize:** P. Ng.

DEPARTMENT OF METALLURGY

W. F. Brazener Prize: R. B. Pointon. **Hiorns Prize:** G. P. Jarvill. **Imperial Metal Industries Ltd. Prize:** J. Sidaway.

DEPARTMENT OF PRODUCTION ENGINEERING

Joseph Lucas Ltd. Prize: A. M. Roberts.

DEPARTMENT OF CHEMISTRY

W. W. Butler Prize: W. B. Graham; G. A. Giblin. **C. J. Woodward Prize:** W. Russell Prize. **G. Smith Prize:** A. R. Dudley. **Bakelite Ltd. Prize:** A. Green.

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SUTTON COLDFIELD, 18, Grendon Drive, off Monmouth Drive, close park, superior modern Detached, gas-fired central heating, spacious well-appointed accommodation in excellent decorative order, reception hall, fully-fitted cloakroom, exceptional through lounge, extensively-fitted breakfast/kitchen, 3 double bedrooms (one fitted wardrobes), spacious bathroom (coloured suite), separate w.c., garage, well-laid garden with open outlook to rear; £7,450.—Luff Powell, 44, High Street, Sutton Coldfield, 354 8175.

STUDLEY, very attractive modern freehold Town House, in excellent position, hall entrance, large lounge, fitted kitchen, two bedrooms, contemporary bathroom and garage, offers £4,000.—John B. Homer and Company, Studley 2498.

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TAMWORTH, freehold Semi-detached, full central heating, 3 double bedrooms, bathroom, separate w.c., good bedrooms, large lounge, gardens front and rear, garage, £4,600. — Telephone Tamworth 5678 evenings or weekends.

TARDEBIGGE, near Bromsgrove, substantial freehold, detached, modernised Country Cottage comprising sitting-room, living-room, kitchen, pantry, bathroom, separate w.c., 3 good bedrooms, range of stores, ample garage space, good sized gardens surrounding the propoerty; £4,850.—Arthur G. Griffiths and Sons, 91, High Street, Evesham. Tel. 2982/3.

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WALMLEY, excellent 3-bedroomed modern Semi-detached, convenient to all amenities, and adjoining green belt, gas central heating, spacious hall, well fitted lounge, and separate dining-room, tiled kitchen and bathroom, full width verandah and large garage, £4,800. — 355 2836.

WIDE HORIZON Caravan Park, Aberaeron, Cardiganshire; beautiful stately Bungalows for sale, ¼-mile from the delightful little town of Aberaeron, overlooking Cardigan Bay, ideal for retirement; price £2,400. — Write, ring or call Aberaeron 396.

WORCESTER, Detached House in quiet residential area, easy access M.5, 3 bedrooms, lounge, dining room, bathroom, kitchen, brick built garage, partial central heating, well laid out garden, £5,995, o.n.o. — Apply Bath, 19, Silverdale Avenue, Redhill, Worcester.

THE ROLE OF EXPERIENCE IN MANAGEMENT DECISION MAKING

A dissertation presented in part fulfillment of the requirements for the degree of M.Sc. in Applied Psychology of the University of Aston in Birmingham.

J. J. Ridge

October, 1970

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S U M M A R Y

An attempt has been made to identify a particular element of the management job, in the context of decision making. Experience has been viewed as the ability to bring old ideas to a new situation. Decision making is viewed in terms of management practice rather than theoretical procedures.

The approach is presented in the wider contexts of economics and psychology, in an attempt to identify aspects relevant to management - especially selection, training and development.

Thirteen managers were interviewed, in depth (three hours), in an attempt to examine their approach to their work. Their replies were examined in the context of an approach to Human information processing developed by Schroder et al (1967). This approach lays emphasis on HOW information is used (structural variables) as opposed to WHAT information is used (content variables) in a managers approach to a problem.

The most tremendous thing which has been granted to man is the choice, freedom.

S. Kierkegaard

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P A R T I

INTRODUCTION

I have no inclination to keep the domain of the psychological floating as it were in the air, without any organic foundation. .... Let the biologists go as far as they can, and let us go as far as we can.

Some day the two will meet.

S. Freud

1.1 The Background of Economics and Psychology

1.2 Development of Ideas

1.2.1 The individual in a 'large' maze
1.2.2 The manager and economics and psychology

1.3 The Cognitive Approach

1.4 Human Information Processing

1.5 Objectives

1.1 The Background of Economics and Psychology

This section is extracted from the understanding of the relationship between economics and psychology as put forward by one leading authority, H. A. Simon (1963). It is put here to explain the origin of this particular approach to management decision making.

The decision maker's information about his environment is much less than an approximation of the real environment. The term 'approximation' implies that the subjective world of the decision maker resembles quite closely the external environment but lacks, perhaps, some fineness of detail. The psychological evidence contradicts this view - the perceived world is fantastically different from the 'real' world. The differences involve both omissions and distortions and arise in both perception and inference.

Psychological research has paid most attention to the sins of commission - to the distortions of the external environment in perception and inference. In recent years, experimental work (e.g. Sherif, 1936; and Asch, 1952) has emphasised affect as a cause of distortion. For our purposes however - understanding the relations of psychology to economics - the sins of omission in perception are more important than the sins of commission.

The decision maker's model of the world encompasses only a minute fraction of all the relevant characteristics of the real environment, and his inferences extract only a minute fraction of all the information that is present, even in his model. Under these circumstances, his choices cannot be predicted from a knowledge of the external environment without a knowledge also of the selective mechanisms that are part of his perceptual and problem solving processes (March and Simon, 1958).

Perception is sometimes referred to as a 'filter'. This term is as misleading as 'approximation', and for the same reason: it implies that what comes through into the central nervous system is really quite a bit like what is 'out there'. In fact, the filtering is not merely a passive selection of some part of a presented whole, but an active process involving attention to a very small part of the whole and exclusion, from the outset, of almost all that is not within the scope of attention. We need not argue the issue of 'conscious' and 'subconscious' perception; we need simply observe that every human organism lives in an environment that generates millions of bits of new information each second and that the bottleneck of the perceptual apparatus certainly does not admit more than 1000 bits per second and probably much less.

Equally significant omissions characterize the processing that takes place when information reaches the brain. As every mathematician knows, it is one thing to have a set of differential equations and another to have their solutions. Yet the solutions are logically implied by the equations - they are 'all there', if we only knew how to get at them! By the same token, hosts of inferences might be drawn from the information stored in the brain but they are not. The consequences implied by information in the memory become known only through active information processing, and hence through active selection of particular problem solving paths from the myriad that might have been followed.

If we have a rat in a very small maze, with cheese at one branch point, and if we give the rat plenty of time to explore, we can predict where he will finally go without any very deep knowledge of rat psychology. We simply assume that he likes cheese (a given utility function) and that he chooses the path that leads to cheese (objective rationality). If we now transfer the rat to a maze having a number of pieces of cheese in it, but

a maze that is several orders of magnitude larger than the largest maze he could possibly explore in a rat's lifetime, then prediction is more difficult. We must now know how a rat solves problems in order to determine where he will go; we must understand what determines the paths he will try and what clues will make him continue along a path or go back.

Classical economics was highly successful in handling small-maze problems without depending on psychology. Labour relations, imperfect competition, uncertainty, and long-run dynamics encase the decision maker in a much larger maze than those considered in classical short-run static theory. In these new areas the economist and the psychologist have numerous common interests in cognitive theory that they have not shared previously.

FIGURE 1

A Point of View

Implicit in the analysis is the point that the manager functions in a state of considerable ambiguity. From what is known about responses to ambiguity, which a manager must face rather than avoid, for example when the manager is judged on results but does not know which results are relevant, his own personal preferences and needs will gain a greater hold over the process of goal setting. Sherif and Harvey (1952) suggested when situational anchors are not available as a result of ambiguity, the person tends to resort to internal, or ego standards, which are more diverse. Thus when a system is ambiguous in its assessment of results, managers may tend to introduce their own diverse personal criteria; indeed, this is acutally the only remaining source of standards which can produce some clarity.

1.2 Development of Ideas

1.2.1 The individual in a 'large' maze

What then, determines an individual's behaviour in what may be an infinitely large maze?

Another authority on the relationship between economics and psychology, Katona (1963) emphasises the importance of 'situation' in economic psychology.

"If we make psychological studies, in addition to the more traditional economic-statistical studies, do we gain a better understanding of economic processes (the behaviour of commodities) and are we able to predict economic processes with greater accuracy? .... Economic behaviour can be viewed in either of two ways: as dependent exclusively on situational factors, or as dependent on situational factors as perceived by the decision maker."

Katona (1963) then continues:

"Since human beings are not calculating mechanisms, the concept of the rational man is of no use in economic psychology. On the other hand, the concept of rational behaviour, representing one of several possible forms of behaviour, is worth analysis. Careful deliberation, seeking of information and consideration of alternative courses of action have been found to be characteristic features of rational behaviour. Such behaviour resembles to some extent the behaviour studied in problem solving experiments. When psychologists experimented with problem solving, they usually started with giving a problem to the subjects, who were externally motivated to work on it. In contrast to such experiments, economic behaviour offers opportunities to study the conditions under which problem solving occurs.

The major alternative to problem solving behaviour appears to be habitual behaviour - doing what one has done before under similar circumstances - not impulsive or ununderstandable behaviour. Businessmen and consumers abandon habitual behaviour when they perceive themselves to be in a new situation, that is, when a reorganisation of the psychological field is called for."

A basic distinction is to be made between the idiographic and the nomothetic approaches in psychology. Allport (1961) makes this distinction to draw attention to the relative neglect of the idiographic approach which is concerned with the explanation of individual behaviour. The

emphasis is on a specific individual whose cognitive structure is unique. In order to understand the individual's behaviour, many different facets of this complex organism, as a unique individual, will have to be considered.

In contrast, the nomothetic approach in psychology indicates an interest in general laws and principles of behaviour applying to all individuals. The emphasis is laid on groups rather than individuals that constitute the groups and there is a concern with norms and group statistics. With this approach, generalisations and universal variables or personality dimensions are sought which will reduce the complexities of human behaviour viewed in terms of large numbers of different individuals.

The approach put forward here is from the idiographic point of view, in an attempt to examine the characteristics of behaviour in conditions which allow considerable freedom of choice, the 'large' maze. Thus, much work that has been done in the joint field of economics and psychology, for example utility theory, and subjective probability will be of relatively small importance. This is in order to emphasise the importance of the unique, individual decision maker, and how he particularly solves problems, as opposed to how people solve problems according to generally applicable phenomena. (For example, conservatism in information processing performance (Edwards and Phillips, 1964).)

1.2.2 The manager and economics and psychology

What does economics bring to a manager? Baumol (1961) notes the contributions that economic theory can make in the following statements:

"The economist is an expert model builder. Indeed there are few disciplines which produce model builders with such practice and such skill. This, I think, is one of the most important things which the economic theorist can contribute to the work of management science. In management science it is important - in fact, absolutely essential - to be able to

recognize the structure of a managerial problem. In order to be able to analyse it at all and to be able to do so systematically, it is necessary to do several things: first of all, to undertake a judicious simplification - an elimination of minor details which are peripheral to the problem and which, if included in the model, would prevent any systematic and successful analysis. Second, it is important to capture in a formal statement the essence of all the interrelationships which characterize the situation, because it is only after stating these interrelationships so explicitly that we can hope to use the powerful techniques of rigorous analysis in the investigation of a managerial problem."

Baumol (1961) suggests that the second way in which economic theory may be helpful to managerial science is to provide a set of analytical methods. He makes the point that it is not necessarily the final theorems of economics that are important to management, but rather the method of reasoning.

Baumol (1961) concludes that:

"A managerial economist can become a far more helpful member of a management group by virtue of his studies of economic analysis primarily because he learns to become an effective model builder and because there he acquires a very rich body of tools and techniques which can help him to deal with the problems of the firm in a far more rigorous, a far more probing and a far deeper manner."

However, as Beer (1967) is able to point out, economics is not the only discipline that affords models that are of use to management. It is a developing characteristic of the approach to industrial problems today in operational research that an interdisciplinary team is employed.

Psychology, as well as being a source of models (e.g. see Beer, 1966) has had uses for the manager slightly different from the operations research use of its concepts. 'Personnel' has been an area of the firm that has been subject to the application of psychological techniques. Psychology has been a source of knowledge about people and their relationship to the environment, and about individual differences between people (Tillet et al.1970).

However, there are limitations in the extent of understanding as yet developed in both economics and psychology. Both sciences are young compared to traditional natural sciences.

Cattell (1967) comments, rather strongly:

".. in retrospect, it appears as if only the wandering gypsy fringe of academic psychology, as seen in the freely operating research clinicians and social psychologists, courageously kept up in the wilderness of that study of the full range of human behaviour from which the brass instrument and psychometric purists had gradually withdrawn."

However, as Warr (1970) points out, it is the vastly improved tools of analysis developed out of the struggle for experimental rigour and statistical refinement that are increasingly being employed to examine cognitive abilities. Warr (1970) names this development as "contemporary introspectionism".

Some recent approaches to cognition can be seen in the work of Heider (1958), where the main interest is how a subject perceives a significant environment and how he achieves structure (cognitive balance); Festinger (in Cohen et al., 1962) which may be seen as an interpretation of how man achieves a unified system of beliefs, or congitions, by adopting particular stratagems which look very much like defence mechanisms; and Witkin (1964) where cognitive styles are characteristic fashions of experience of the world and self.

"It is not accidental that the work of ... Heider, Festinger and Witkin has some popularity in Europe. Their approach is congenial to the phenomenological bias which is so significant for the history of psychology on the European continent. Perhaps their work exemplifies, as Taft (1964) remarked, 'Europe's gift to American psychology'. All the same, one can only hope that European psychology, which never went through the purifying mills of Watsonian idealogy, will not recognize the cognitive approach as phenomenological, but will also accept the sophisticated research technology it needs. The spirit and the flesh." (Van de Geer and Jaspars, 1966.)

Figure 1 is an attempt to emphasise the position of a manager in a situation which may also be likened to the spirit and the flesh. Probably, the most important qualification for management positions today is experience. An academic background in economics and psychology does not equip an individual manager with the ability to understand people and resources sufficiently well. To the extent that it is impossible to lay down routines to deal with situations, an individual is the last resort. The 'flesh' may constitute the more certain understanding of a situation; and the 'spirit' the somewhat intangible mysterious understanding that is necessary in more complex and uncertain situations managers are usually faced with, where there is no means of reducing the situation to simple choice out of an identification and understanding of all the relevant facts. As Simon (1960) points out, decisions do get taken, despite the inability to understand.

The 'spirit' may be understood to some extent as an individual value system. Jacob and Flink (1962) define a value as

".. a conception, explicit or implicit, distinctive of an individual or characteristic of a group, of the desirable which influences the selection of available modes, means and ends of action .... Value may be defined as that aspect of motivation which is referable to standards, personal and cultural, that do not arise solely out of immediate tensions or immediate situations."

Taylor (1960) outlined how motivation might be incorporated in computer programmes by an information processing approach.

"In what we believe is the true spirit of the cognitive approach, the field of motivation is not differentiated as a unique area - motivation is related, instead, to the patterning of directed behaviour. A program is a pattern of decisions governed by values assigned to possible outcomes. A value is a concept like any other, with the difference that value concepts include desirability as one attribute associated with them. Value assignment capitalizes past experience; every individual may therefore be supposed to have developed his own value heirarchy."

Psychology, like economics, is a science concerned with the inter-dependence among certain events, rather than their physical nature (Neisser, 1967). Although there are many disciplines of this sort (e.g. classical genetics) the most prominent ones today are probably the so called 'information sciences' which include the mathematical theory of communication, computer programming, systems analysis and related fields. It seems obvious that these must be relevant to cognitive psychology which is itself much concerned with information. However, their importance for psychologists has often been misunderstood and deserves careful consideration.

1.3 The Cognitive Approach

As used here, the term cognition refers to all the processes by which sensory input is transformed, reduced, elaborated, stored, recovered and used (after Neisser, 1966). Given such a sweeping definition, it is apparent that cognition is involved in everything a human being might possibly do; that every psychological phenomenon may be seen as a cognitive phenomenon. But although cognitive psychology is concerned with all human activity rather than some fraction of it, the concern is from a particular point of view, the world of experience is produced by the individual who experiences it.

Van de Geer and Jaspars (1966) attempt to clarify the usage of the term cognition by placing it on a scale ranging from neobehaviouristic mediation attempting to extend learning principles, originally developed from experiments on simple learning, to the domain of complex behaviour, to phenomenological interpretation and a certain scepticism about the universal usefulness of the experimental method. It is possible to specify the nature of cognition as an individual apart from these two extremes.

There has been recent emphasis on strategies (N.B. Bruner, Goodow and Austin, 1956): is selectively collecting inputs in order to arrive at final or semifinal decisions; he brings with him a view of his own in dealing with his environment. This seems to imply that cognitive behaviour cannot be explained on the basis of learning principles alone. Rather,

"we must look for principles which govern the selection of experience and its further processing. Experience does not come in and settle down like the sand in a river; internal representation is not a sediment. Humans impose their views upon the environment and not the other way round." (Van de Geer and Jaspars, 1966).

Distinction can be made between a cognitive approach and a physiological approach by an analogy. The task of a psychologist trying to understand human cognition is analogous to that of a man trying to discover how a computer has been programmed, rather than the make-up of the hardware. This is not to say that the hardware, or physiology may have no effect on the organisation of mental events. The aim is to identify, if the program seems to store and re-use information, by what routines and procedures this is done. A program is a series of instructions for dealing with symbols: if the input has certain characteristics ... then carry out certain procedures ... otherwise other procedures ... combine the results in various ways ... store or retrieve various items ... depending on prior results ... use them in further specified ways. The cognitive psychologist would like to give a similar account of the way information is processed by men.

There were cognitive theorists long before the advent of the computer, e.g. Bartlett (1932). But, in the eyes of many psychologists, a theory which dealt with cognitive transformations, memory schemata, and the like was not <u>about</u> anything. One could understand theories that dealt with overt movements, or with physiology, but what is a schema. If memory consists of transformations, what is transformed. So long as cognitive psychology literally did not know what it was talking about, there was always a danger that it was talking about nothing at all. This is no longer a serious risk. Information is what is transformed, and the structured pattern of its transformation is what we want to understand.

1.4 Human Information Processing

As well as using computers in an analogy to human cognition and information processing, computers serve the same purpose as mathematical models. They can provide a conceptual tool which does not permit of vagueness and will quickly bring to light any weakness of conceptualisation which might have passed unnoticed. Computer simulation of thought is an attempt to write programs which faithfully reproduce human thought protocols obtained by having subjects think aloud. The best known work in this area is that of Newell, Shaw and Simon (1957, 1958). Since their publications on simulation of theorem solving - the logic theorist program - much advance has been made. The approach is emphasised by a statement by Newell (1963):

> "The first thing we have learned (....) is that we can explain many of the processes of human thinking without postulating mechanisms at subconscious levels which are different from those that are partly conscious and partly verbalized. The processes of problem solving, it is turning out, are the familiar processes of noticing, searching, modifying the search direction on the basis of clues, and so on. (....) It looks more and more as if problem solving is accomplished through complex structures of familiar simple elements."

Reitman (1965) gives a good account of this approach to rigourously explain cognition and thought. He summarises that the information processing approach to the study of man follows his purposes and plans as he seeks, does and creates things manipulating objects and information to attain his ends. As such, this approach is pertinent to the work of experimental, clinical, social, industrial and educational psychologists - wherever in other words, a precise yet comprehensive understanding of central processes is a pre-requisite.

However, in the context of applied psychology, where interest lies in more immediate utilisation of psychological knowledge in fields outside professional psychology a somewhat different approach to human information

processing has been investigated. The Schroder, Driver and Streufert (1967) approach is concerned with how people use conceptual structures such as attitudes for adaptive purposes. Attitudes, needs, strategies, concepts and norms are viewed as information processing structures. There is minimal concern with content, that is, the what or the directionality of these conceptual structures.

In the theorectical orientation presented by Schroder et al. (1967), information processing in a given situation involves the perception and the subsequent organisation of various kinds of information. The perceptual component represents a filtering process whereby stimuli are scaled along certain unique attributes or dimensions. The number of unique dimensions along which stimuli (such as people, nations or events) "take on" meaning is called "the degree of differentiation". However, the specific aim is to examine the organisation of these different kinds of information.

"The degree of integrative complexity involved in the organisation of differentiated attributes is the major variable." This is explained in more detail in Appendix 1. Here the units of organisation (the parts at this level of analysis) are the scale values of stimuli on all relevant dimensions. The properties of organisation are:
(a) the number of combinatory conceptual rules of perspectives that weight and combine dimensional scale values in a particular way, and
(b) the linkages or connectedness between these different perspectives. That is, a metric is proposed for describing organisation; namely the number and interrelatedness of combinatory conceptual schema.

Compared to that of lower animals, human "thought" is characterised by the generation of more alternatives. More meanings can be attributed to objects, and a greater number of connections (relations) between these

meanings arise. In this way, human thought is less stimulus bound; action can be delayed; a given stimulus gives rise to a greater number of outcomes, creating more uncertainty and ambiguity. Taking an extreme case, the moth has no alternative when faced with a "light" and immediately flies toward it, whereas a human engaging in complex thought processes can perceive stimuli in many ways and can consider many ways of interrelating these perceptions for his adaptive purposes. In this sense, human thought may be seen to have more degrees of freedom.

The difference between man and the higher order animals lies not so much in the ability to learn or utilise the meanings of a large number of stimuli, but rather in the ability to learn and to utilise alternate meanings of the same stimulus and to build up and use patterns of inter-relatedness within the same set of meanings. This change, from lower to higher levels of thought, is a matter of degree, paralleling the evolutionary scale across species and developing with age (to an upper neurological limit under optimal environmental conditions) within species.

Computer technology has opened up exciting new vistas in the objective study of human thought. However, even the most complex present lay computers are very simple information processing structures, particularly when compared to mature human thought. Regardless of how complex the set of instructions, the program represents a fixed way of handling information. It can only be modified by an external agent (the programmer) and will work as decision making devices only if the environment remains static. As creative, adaptive structures, computers are very simple.

With advances in computer technology and theory, it will be increasingly possible to write complex programs instructing computers to develop and try out new information processing rules that have been entirely created within

the system. The "General Problem Solver" (Newell, Shaw and Simon, 1958) and the Perceptron (Rosenblatt, 1958) represent the first steps in this direction. However, the main role of the computer is to store a large amount of information and handle it according to information processing rules developed by programmers. In this sense, the computer, representing fixed program functioning, and man, representing the selective, heuristic postulator and theorizer, complement each other well in decision making.

1.5 Objectives

The purpose of this introduction is to explain the background to the particular problem of human behaviour that is to be investigated, management decision making. The state of psychological knowledge relevant to this problem has been examined, and found to be lacking. Simon (1960) states:

"We have not had, in the past, adequate knowledge of the processes that are involved in decision making in complex situations. Human thinking, problem solving and learning have been mysterious processes which we have labelled but not explained. Lacking an understanding of these processes, we have had to resort to gross techniques for improving non-programmed decision making: selection of men who have demonstrated their capacity for it, (through prior experience) further development of their powers through professional training and planned experience; protection of non-programmed activity from the pressure of repetitive activity by establishing specialized organisational units to carry it on. We cannot say that these traditional techniques have failed - decisions do get made daily in organizations. Neither can we say we might not do very much better in the future as our knowledge of the decision making process grows."

Porter (1966) comments that an "area where the field (of personnel management) could profit from a simultaneous 'individual differences' - 'social psychology' approach is the age-old criterion problem. ... For the future we will need an integrative approach to develop greater understanding concerning the types of criteria of job performance that are most relevant for given organisational situations."

Objectives for research in applied psychology have been put by Singleton (1970):

a) it will throw some light on some principle of some kind of human behaviour in the real world, and

b) it will be of some practical utility to somebody outside professional psychology within five years.

The objective of this dissertation is to examine recent developments in understanding the "mysterious processes" to see if they can help in

understanding management decision making. The recent developments are the approach to human information processing put forward by Schroder et al. (1967) and a general manual for scoring structural properties of verbal responses (see Appendix 2) which broadly attempts to examine the level of abstract thinking used in processing information.

Thus, objectives more specifically may be seen as:

1. To examine if it was possible to generate, in an interview situation, responses that were relevant to the framework developed by Schroder et al. (1967).

2. To examine the concept of abstract thinking as relevant to management practice, in different management situations.

A means of differentiating between management situations is suggested by Martin (1956). The decision situation was regarded as the whole range of management activity, "from the preliminary stages, through the actual decision and implementation to verification of the correctness or incorrectness of the decision". The main differences in decision situations were isolated as the length of the time perspective, the amount of continuity, and the degree of uncertainty. The decisions at the lower levels of the management heirarchy were much more clear cut. What had to be done was more easily seen, it usually had to be done quickly and there was less uncertainty about the result than at higher levels. At the higher levels the decision situation was much more indefinite. The time within which action should be taken was often indeterminate as it could depend on the judgement of the total situation; what should be done was often difficult to decide because there were so many elements of uncertainty in the decision.

Martin's (1956) research suggests that the differences in the nature of the decisions are not evenly spaced from one management level to another.

Thus the differences between management situations are not clearly defined. Managers were interviewed with regard to four situations. The situations are demonstrated in Appendix 3.

The method of examination can be seen as the Critical Incidents Technique, developed by Flanagan, 1954. Flanagan defines the critical requirements of a job as those behaviours which are crucial in making a difference between doing the job effectively and doing it ineffectively. Critical incidents, as the term implies, are simply reports by qualified observers of the things people did that were especially effective or ineffective in accomplishing parts of their jobs.

P A R T I I

MANAGEMENT DECISION MAKING

As a matter of fact, for ordinary purposes, very exact repetition is more of a hindrance than a help. Generally we have to use what we can remember to help us to do something different that has cropped up.

F. C. Bartlett (1951)

2.1 Management

- 2.1.1 History and development of thought
- 2.1.2 Definitions
- 2.1.3 The art and science of management

2.2 Decision Making

- 2.2.1 The context
- 2.2.2 The process

2.3 Experience

- 2.3.1 The use of experience
- 2.3.2 Experiments with experience

2.4 Information

- 2.4.1 A technical look at information
- 2.4.2 Decision making and uncertainty
- 2.4.3 Structure and content
- 2.4.4 The use of information

2.1 Management

2.1.1 History and development of thought

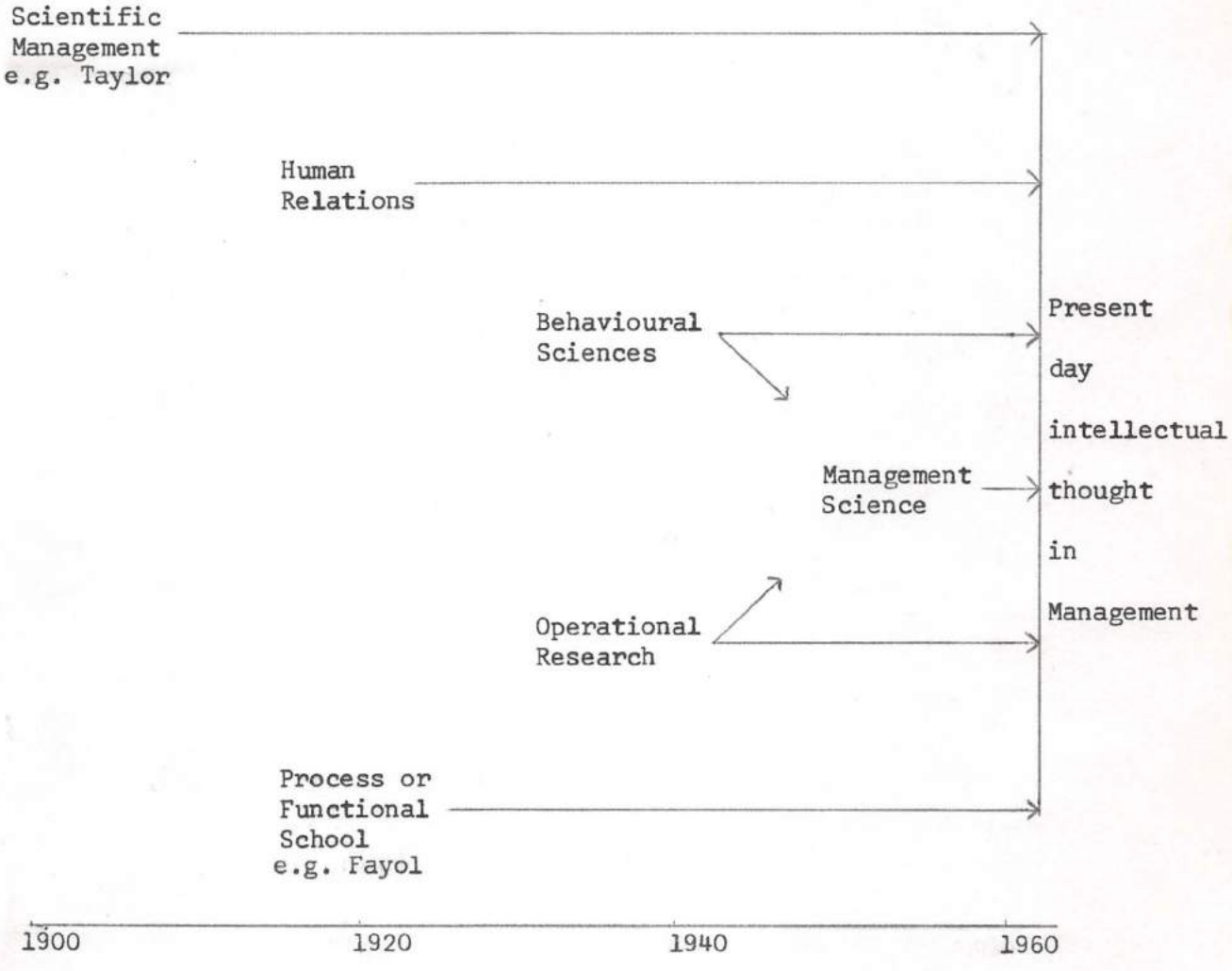
Management has been practiced since the early beginning of time. However, "management thought is a product of the twentieth century" (Mee, 1963). Probably the most important stimulus to management thought was the industrial revolution which began in England around the middle of the eighteenth century. Prior to this time, most business enterprises were small, characterized by hand craftsmanship rather than mass production, and faced problems much simpler than those faced today by many firms in our complex and rapidly changing industrial society. In consequence, relatively little need was perceived for giving systematic attention to the problems of management.

At the same time as changes in the socio economic environment (e.g. social legal and technological developments) a basic change in the form of management in business firms occurred. Managerial tenure became dependent on performance rather than ownership as there was an increasing separation between ownership of business from its management.

It is possible to view progress in management thought, (as in psychological investigation) through differing schools, or approaches. This is portrayed in Figure 2.

In an organisation, the manager's problem may be seen as a microcosm of Figure 1; he requires to know the optimum utilisation of materials, and people, using his knowledge of the relationships between the values of his materials, and also using his knowledge of human behaviour in order to convert his knowledge into action through other people.

FIGURE 2



Chronology of Management Thought

(Source: Richards and Greenlaw, 1966)

2.1.2 Definitions

The definitions of management are more varied than the descriptions of its functions as developed by management theorists from Fayol to the present day. Hall (1968) comments that the formula for successful management basically has not changed in over 2000 years.

"He who has judgement enough to find out what things are best for him, and ability to procure them, can hardly fail of success, whether his design be to direct the stage or govern the state, manage his own house or command the army." (From Xenaphor's memoirs of Socrates.)

Simon (1960) uses management and decision making as effectively meaning the same thing. Brech (1953) defines management as:

"A social process entailing responsibility for the effective (or efficient) planning and regulation of the operations of an enterprise, such responsibility involving - (a) the installation and maintenance of proper procedures to ensure adherence to plans and (b) the guidance, integration and supervision of the personnel comprising the enterprise and carrying out its operations."

or more simply as planning and regulating (or guiding) the activities of an enterprise in relation to its procedures, and to the duties or tasks of its personnel.

Drucker (1955) describes management as "a multi purpose organ that manages a business and manages managers and manages workers and work". This description is more concrete and pinpoints different aspects of the manager's job. Drucker (1955) attaches great importance to the formulation of objectives, and lists eight areas in which he thinks objectives of performance and results should be set, in the industrial situation: market standing, innovation, productivity, physical and financial resources, profitability, manager performance and development, worker attitude and performance, and public responsibility.

Stewart (1963) simplifies the nature of the manager's job by making a distinction between deciding what to do, and, getting it done. The manager's

job can, therefore, be broadly defines as "deciding what should be done and then getting other people to do it". A longer definition would be concerned with how these two tasks are to be accomplished. The first task involves setting objectives, planning, including decision making, and setting up formal organization. The second consists of motivation, communication, control including measurement, and the development of people; (and thus a second set of decisions).

The need for definition can be seen in the need to develop management education. However, "our understanding of what we need to do to train managers falls far short of our technical mastery of the training of circus animals" (Revons, 1966). Revons (1966) continues to relate a point made at a B.I.M. conference on management education.

"It is easy to talk generally about the need for a 'broadening process' for managers and for an 'educational experience', but what do we expect a man to know or be able to do after having been 'educated' that he did not know or could not do before he went there? Nobody at Brighton really seemed to have asked this detailed question. Nor has industry, on its side, tried as yet to pinpoint the sort of areas where it feels university research might be conducted in order to be really valuable. It was worthwhile to talk in general terms but the next stage will have to be more precise.

The danger of asking for a clear definition of problems is that some enthusiasts will hurry forward with their own definitions, couched in the new language that is rapidly being formed around management to conceal an absence of clear thinking. One could devise a diverting new parlour game, inventing meaningless definitions of management in the new 'idom'. ..... controlled co-ordination of resources under environmental pressures within and without the business arganism for the integrated response of the G R O U P to situational forces present in the decision making process directed towards the optimization and maximization of variables consistent with the parameters defining the strategic objectives of the enterprise ..." And so on.

2.1.3 The art and science of management

Whether management is a science, or an art is a question discussed quite considerably by management thinkers. An art is a "skill in performance acquired by experience, study, or observation; knack." In contrast a science is "a branch of study concerned with observation and classification of facts,

especially with the establishment of verifiable general laws, chiefly by induction and hypotheses. Management has long been considered a practicing art." Since the days of Taylor, however, management scholars have been attempting to reduce the art to a science of management. (Richards and Greenlaw, 1966).

Beer (1966) however, makes the point that management science is an attempt to "augment by scientific method the processes of which brains are capable in making judgements and taking decisions. There is no question of trying to 'reduce' the process of management to a science." "Scientists are people who have been trained in ways of examining the world which offer the best known means of making our beliefs about the way that world behaves, correspond to the facts."

The manager today needs to survey present advanced management methods; to evaluate the process by which decisions today are actually reached and in which scientific method has no part; and he needs then to consider what it would be like to use the methods of modern science that are in fact available.

2.2 Decision Making

2.2.1 The context

Decision making can be defined, quite simply, as choice; or, with more involvement as "the focal creative psychic event, where knowledge, thought, feeling and imagination are fused into action" (Shackle, 1961).

A real-life decision involves some goals or values, some facts about the environment and some inferences drawn from the values and facts (Simon, 1963). The goals and values may be simple or complex, consistent or contradictory; the facts may be real or supposed, based on observation or the reports of others; the inferences may be valid or spurious. The whole process may be viewed, metaphorically, as a process of "reasoning", where the values and facts serve as premises, and the decision that is finally reached is inferred from these premises. The resemblance of decision making, where the limitations of the decision maker and the complexity of the environment are central concerns, to logical reasoning is only metaphorical, because there are quite different rules in the two cases to determine what constitute 'valid' premises and admissible modes of inference. In this situation "logic is the mirror of thought" (Piaget, 1950).

Figure 3 is an attempt to explain the context of the decision making behviour examined here. Broadly speaking, economics can be defined as the science that describes and predicts the behaviour of several kinds of economic man - notably the consumer and the entrepreneur. While perhaps literally correct, this definition does not reflect the principal focus in the literature of economics. It is possible to classify work in economics along two dimensions: (a) whether it is concerned with industries and the whole economy (macro-economics) or with individual economic actors (micro-economics); and (b) whether it strives to describe and explain

FIGURE 3

The areas of study of Economic Choice

	Descriptive	Normative
Macro-	e.g. perfect competition	e.g. business cycle theory
Micro-		e.g. management science

economic behaviour (descriptive economics) or to guide decisions either at the level of public policy (normative macro-economics) or at the level of the individual consumer or business man (normative micro-economics).

The profession and literature of economics have been largely preoccupied with normative macro-economics. Although descriptive macro-economics provides the scientific base for policy prescription, research emphases have been determined in large part by relevance to policy (e.g. business cycle theory). Normative micro-economics, carried forward under such labels as management science, engineering economics and operational research, is now a flourishing area of work having branched somewhat away from traditional economics.

Economists have been relatively uninterested in descriptive micro-economics - understanding the behaviour of individual economic agents - except as this is necessary to provide a foundation for macro-economics. The classical economic theory of markets with perfect competition and rational agents is deductive theory that requires almost no contact with empirical data once its assumptions are accepted. Without denying the importance of this area, it fails to include some of the central problems of conflict and dynamics with which economics has become more and more concerned. In these newer areas, complexity and instability of his environment becomes a central feature of the choices that economic man faces. To explain his behaviour in the face of this complexity, the theory must describe him as something more than a featureless adaptive organism; it must incorporate at least some description of the processes and mechanisms through which the adaptation takes place.

In simple, slow moving situations, where the actor has a single, operational goal, the assumption of maximisation relieves us of any need to construct a detailed picture of economic man or his process of adaptation. As the complexity of the environment increases, or its speed of change, we need to know more and more about the mechanisms and processes that economic man - in this case a manager - uses to relate himself to that environment and achieve his goals.

Management Science is an attempt to help the manager relate to his environment. The decision models developed by operational research can be thought of as a simulation of the corresponding human decision maker, in which the equations and other assumptions that enter into the formal decision making procedure correspond to the decision premises of the individual decision maker.

2.2.2 The process

A means of understanding the decision making process is to contrast the final moment of choice with the lengthy complex processes of alerting, exploring and analysing that precede the final moment. The fundamental step in understanding decision making is an analysis of the process into separable functions, and detailed further analysis of each such function.

An example of the phases of decision making is given by Simon (1960). The first phase of the decision making process - searching the environment for conditions calling for decision is named 'intelligence' (after the military meaning of the word). The second phase - inventing, developing and analysing possible courses of action is called 'design' activity. The third phase - selecting a particular course of action from those available is 'choice' activity.

Generally speaking intelligence activity precedes design, and design activity precedes choice. The cycle of phases is, however, far more complex than this sequence suggests. Each phase in making a particular decision is itself a complex decision making process. The design phase, for example, may call for new intelligence activities; problems at any given level generate subproblems. There are wheels within wheels within wheels. Executing Decision is again Decision making activity.

"Decisions weave individual choices into a web of relationships that constitutes a basis for action." (Gore and Dyson, 1964.)
Viewing decisions in this way, decision making may then be seen as a response mechanism.

Every descriptive model in psychology actually contains two parts. One is a description of the environment and task facing the organism; the other is a description of the basic response tendencies that the organism brings to that environment and task. The interplay of these two kinds of description produces the detailed predictions about the behaviour of the organism in the situation.

Often, the description of the environment and of the task is very much more sophisticated than is the description of the response tendencies that the organism brings to that environment and task and the predictive success of many descriptive models in psychology depends, not on the effectiveness of their description of the organism, but on the effectiveness of their description of the environment. Normative models of decision making are descriptions of an environment and of a task with few assumptions about the response tendencies that the organism brings with it; they are incomplete as descriptive models. It is relatively simple to add to normative models assumptions about behaviour in response to decision making

tasks and come up with sophisticated predictions about what men will actually do.

Figure 4 demonstrates a classification of techniques of decision making. (Simon, 1960.) The distinction between programmed and nonprogrammed decisions may be viewed as two extremes of a continuum rather than as a clear cut division. Enquiries as to how managers in organizations make nonprogrammed decisions generally leads to a reply explaining that they exercise judgement, and this judgement depends in some undefined way upon experience, insight and intuition. If the decision was a particularly difficult one, the explanation may be that creativity was required. This may label the phenomena, but it does not explain them in such a way that would help a manager lacking these derirable qualities or abilities.

FIGURE 4

Traditional and Modern Techniques of Decision Making (Simon, 1960)

TYPES OF DECISIONS	DECISION-MAKING TECHNIQUES	
	Traditional	Modern
Programmed: Routine, repetitive decisions Organization develops specific processes for handling them	1. Habit 2. Clerical routine: Standard operating procedures 3. Organization structure: Common expectations A system of subgoals Well-defined informational channels	1. Operations Research: Mathematical analysis Models Computer simulation 2. Electronic data processing
Nonprogrammed: One-shot, ill-structured novel, policity decisions Handled by general problem-solving process	1. Judgement, intuition, and creativity 2. Rules of thumb 3. Selection and training of executives	Heuristic problem-solving technique applied to: (a) training human decision makers (b) constructing heuristic computer programs

2.3 Experience

2.3.1 The use of experience

Audley (1967) writes

"As you might expect, individual differences and experience also play a role in the quantitative appraisal of evidence. One rather frivolous example which I cannot resist describing is as follows. Subjects were presented with a 'find the lady' situation. Actually there was no lady, only a pea. This was hidden under one of three walnuts, and the subject had to indicate where it was hidden. The game was repeated until a correct choice was made. As there was not a pea either, this never happened. But at some point people in one way or another express doubts as to its prescence. The subjects in this experiment were all psychology postgraduate students, but some specialised in clinical psychology and others in experimental psychology. The experimental group were very cautious and the number of games they watched was the same that would be required by a statistician who wanted to keep errors down to below one in a hundred. The clinicians average sample size correspond to the higher error rate of one in twenty decisions. It may be reassuring to point out that there is no clear evidence that willingness to take a risk is a personality trait general to all of man's choices."

Audley (1967) concludes his discussion on "what makes up a mind" by

deciding that "what makes up a mind is its history, and evidence too - but only if that is in the right direction. Or to put it another way, minds quite often come already made up."

The experience of managers has lead to formulation of management principles. A principle can be defined as a "settled rule of action; a governing law of conduct ...." (Webster's Collegiate Dictionary, 1941). The effectiveness of a course of action may be determined by observing its impact under controlled conditions, either in an actual organization or in a laboratory situation. If the observation reveals that a particular stragegy is successful only under certain conditions, the principle prescribing its effectiveness must be modified to take into account these conditions. Control of as many variables as possible is attempted in experimentation and research while the principle is tested so that differences in results can be attributed to the effect of the principle rather than some other factor. Research by observational and experimental means is preferable to personal experience as a means of developing principles since extraneous or

unobserved variables in experience may influence the effectiveness of the principle. However, much writing on management can be seen to consist of principles derived from "experience" rather than strict experiment.

Experience-based decision methods are subject to certain limitations each manager's background is limited, and his previous experience may not provide an adequate sample upon which to base current decisions. For this reason, decision in new situations may fail because of false premises derived from past experience. Further, human memory, observation, and interpretation of data are also limited. Therefore, even if a managers assumptions are correct, incomplete knowledge and faulty interpretation of data can undermine the effectiveness of experience based decisions. On the other hand, if the manager can avoid over-generalizing from past experience, and accurately perceive how the key variables existing in new decision problems are similar to or different from those in previously encountered situations, experience-based methods may prove quite effective.

Experience based methods may be necessary for dealing with the many problems which confront managers daily, and for which there are no analytical, or 'science-based' solution methods available. Also, decision problems often have to be made quickly, and there may not be time to apply complex time consuming scientific analysis to their solution.

2.3.2 Experiments with experience

Beer (1966) proposes in some detail how "scientific thinking" may help a manager "bring experience to bear" in a situation. This is a means of overcoming limitations of a particular manager's experience in that his "model of the world encompasses only a minute fraction of all the relevant characteristics of the real environment" (Simon, 1963).

Beer (1966) places the approach of 'scientific thinking' in its attempt to assist management as a formalisation of models of situations. He distinguishes a model as being "not direct perception of the world". Quite simply, one may think of a cow without perceiving one. The manager contemplates his model of a situation and compares it with models of other and similar situations that have been known to him. He "brings his experience to bear." The difference between a manager's use of a model and a scientist's is that the latter is more "professional" about its use. He is self-conscious about the model he uses; he deliberates about it; he tries to make it richer and therefore a better replica of reality; he examines how it hangs together, and may try to express it in the rigorous language of science.

To the extent that a manager finds himself in a novel situation, he must search for some rules for translating his model from experience into an accurate predictor of the new situation. Beer (1966) develops the homomorphic model (Figure 5) to explain how operational research thinking may aid managers, not only as a fund of experience, but also as a fund of rigour that will ensure more chance of eventual understanding of the situation.

In Figure 5, there is a managerial situation of which a conceptual model

has been formulated. All the insights of the manager's experience will have been incorporated into the model. Similarly the operational research approach is to select from its scientific situation a conceptual model incorporating its insights into how that situation really works and which it believes bears marked resemblances to the managerial situation.

The approach is then to consider possible agreements between these two models. It tries to determine the extent to which the behaviour of one system throws light on the behaviour of the other. In what ways the theories currently maintained by scientists in the area concerned might be transplanted into the other; whether the actual techniques of research and computation are appropriate; and above all, whether conclusions which hold for the one system hold (and if so, under what tests of verification) in the other.

The attempt is made to establish a mapping between the two conceptual models under some transformation which would be isomorphic, in a neutral scientific language. This may be achieved by working at various levels of comparison e.g. simile, analogy.

Having refined the conceptual models, the operational research procedure would be to produce two deeper level homomorphic models which may be isomorphic. Beer (1966) defines a scientific model as a "homomorphism onto which two different situations are mapped, and which actually defines the extent to which they are structurally identical."

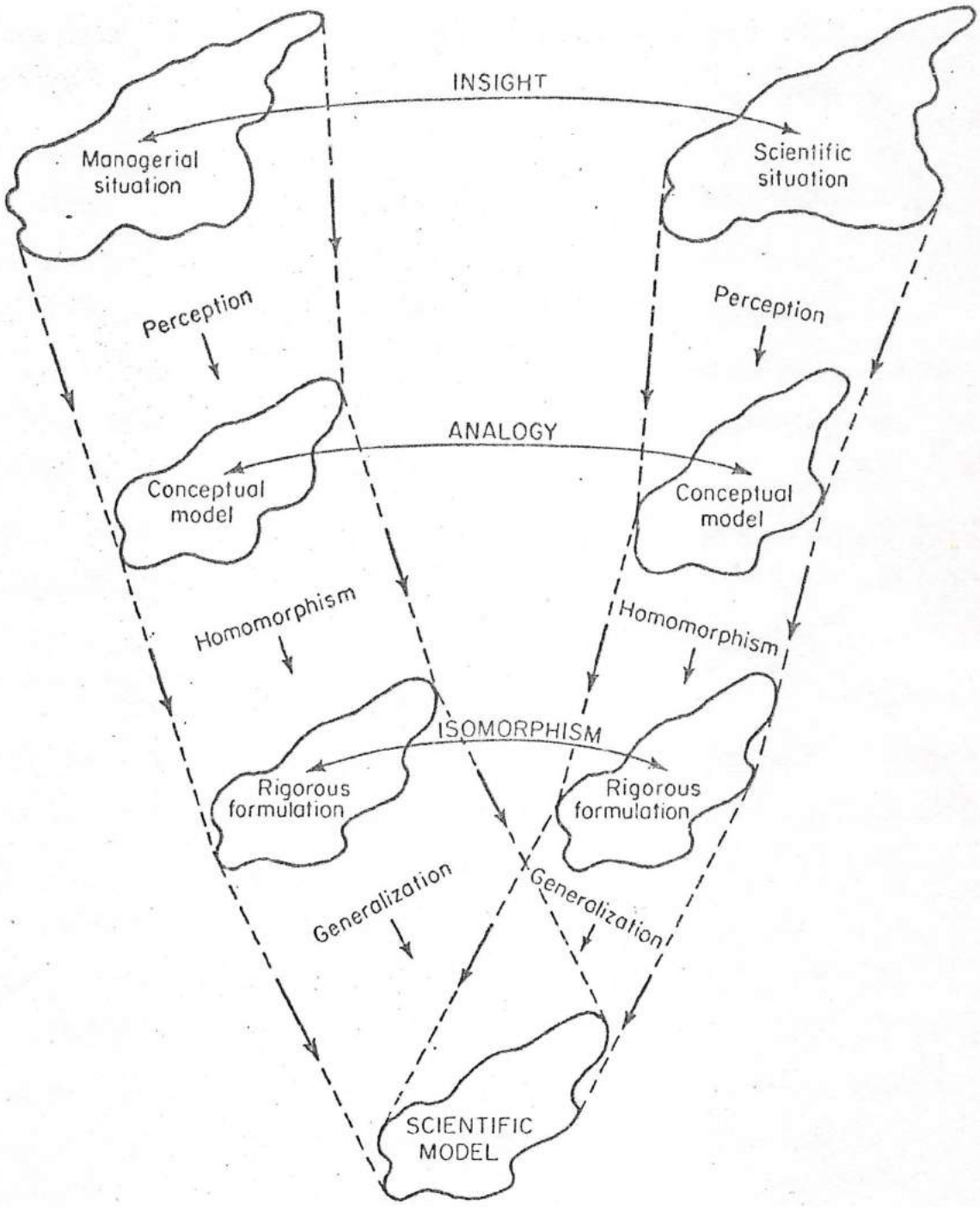


FIGURE 5 The nature of a scientific model.

Beer (1966)

2.4 Information

2.4.1 A technical look at information

Information implies a gain in knowledge in some manner (Fitts and Posner, 1967). A technical definition of the term, as developed in communication engineering (Shannon and Weaver, 1949) is both more precise and less general. In order for information to be conveyed, there must be uncertainty. Information may thus be seen as a reduction in uncertainty. The amount of information potentially available increases with the amount of uncertainty in the situation. The statement that two plus two equals four would convey no information to most people because there is no uncertainty about the relation to begin with. The assertion that the result of a coin flip was 'either heads or tails' conveys no information, because it does not reduce our genuine uncertainty about the outcome. However, the simpler statement 'it was tails' does convey information.

The amount of information in a statement increases with the number of possible things which might have occurred. Thus there is more information in a statement that a die came up four than that a coin came up tails, because six things could have occurred with the die and only two with the coin. There was, to begin with, more uncertainty with respect to the die. The amount of information then increases with N, where N is the number of possible things which might have occurred.

The word amount is of considerable importance. In the traditional, engineering sense it bears no relation to the value, meaning, purpose or kind of information presented. Thus Miller (1953) commented:

"Most of the careless claims for the importance of information theory arise from overly free association to the word 'information'. This term occurs in the theory in a careful and particular way. It is not synonymous with 'meaning'. Only the amount of information is measured - the amount does not specify the content, value, truthfulness, exclusiveness, history or

purpose of the information. The definition does not exclude other definitions and certainly does not include all the meanings implied by the colloquial usages of the word."

Garner (1962) proposes that the amount of information in a stimulus array (or more precisely, the amount of uncertainty residing within the array) may be a determinant of the psychological meaning of those stimuli to an individual. This leads to an emphasis which departs from the technical use of information in communications, concerning measurement of amount transmitted, to the meaning of meaning, and a proposal that uncertainty and structure (the nature of the form of that uncertainty) are crucial variables of meaning.

Schroder et al. (1967) point out that information may be viewed as any input that changes probabilities or certainties in any way. An input that actually increases uncertainty could then be information. If an input decreases uncertainty by one half (that is, by one 'bit') it also is information; but as Schroder et al. (1967) view it, it is only one kind of information.

2.4.2 Decision making and uncertainty

Knight (1921) suggested that decisions can be made under conditions of certainty, risk and uncertainty. A decision under certainty occurs if each possible course of action has a unique outcome. In these conditions, choosing among outcomes or consequences is the same as choosing among the possible courses of action. If the courses of action can be ranked in order of preference, decision making is made routine. A decision under conditions of risk means that more than one possible outcome or set of consequences is associated with each course of action, but that probabilities for the outcomes can be stated. Finally, decision making under conditions of

uncertainty means that more than one possible outcome is associated with at least one of the different courses of action but that probabilities for the outcomes cannot be stated.

In practice, the bounds of the problem may be limitless. How possible is it to recognise the effects of a course of action? Stebbing (1958) comments

"In order that physics as a science should be possible, it is necessary that we should be able to consider some characteristics in isolation from other characteristics. It is in fact the case that physicists have been successful in regarding the physical world as separable into small systems, and into subsystems of those systems, with respect to which physical statements can be made. It may be true that

Thou canst not stir a flower
without troubling of a star,

but it must be admitted that no one stirring a flower has ever succeeded in observing the consequent troubling of a star. Astronomers have prosecuted their researches in the confident belief that in turning their telescopes upon the moon they have in no way affected that which they are observing."

The bounds of the system in economic decisions may be seen to be set by assumptions about the operation of the system.

2.4.3 Structure and content

Two distinct classes of information are relevant to the understanding of adaptation (Schroder et al., 1967). Content variables provide information about the acquisition, direction and magnitude of responses, attitudes, norms and needs. From this standpoint, interest centres on how much a person learns, how long it is remembered, what attitudes or needs he holds, and how intense they are. Here the criterior or metric for describing adaptive orientations is the behavioural outcome measured in terms of the components involved, their magnitude (how much) and their direction (which stimuli are evaluated, negatively or positively).

Structural variables provide a metric for measuring the way a person combines information perceived from the outside world, as well as internally generated information, for adaptive purposes. Here, the adaptive orientation may be seen to act in (a) selecting certain kinds of information from the environment; and (b) like a programme or set of rules which combines these items of information in specific ways. The first aspect is the component or content variable, and the second aspect is the structural or information processing variable.

The more a task can be successfully performed by a fixed, predetermined set of procedures (and providing the task, and interpersonal roles remain static or can be prescribed) the less the significance of structural variables. But in changing task environments in which the environment and the adapting persons interact, and in which exploration and alternate goals, means, strategies and decisions are required, information processing variables are more important in successful performance.

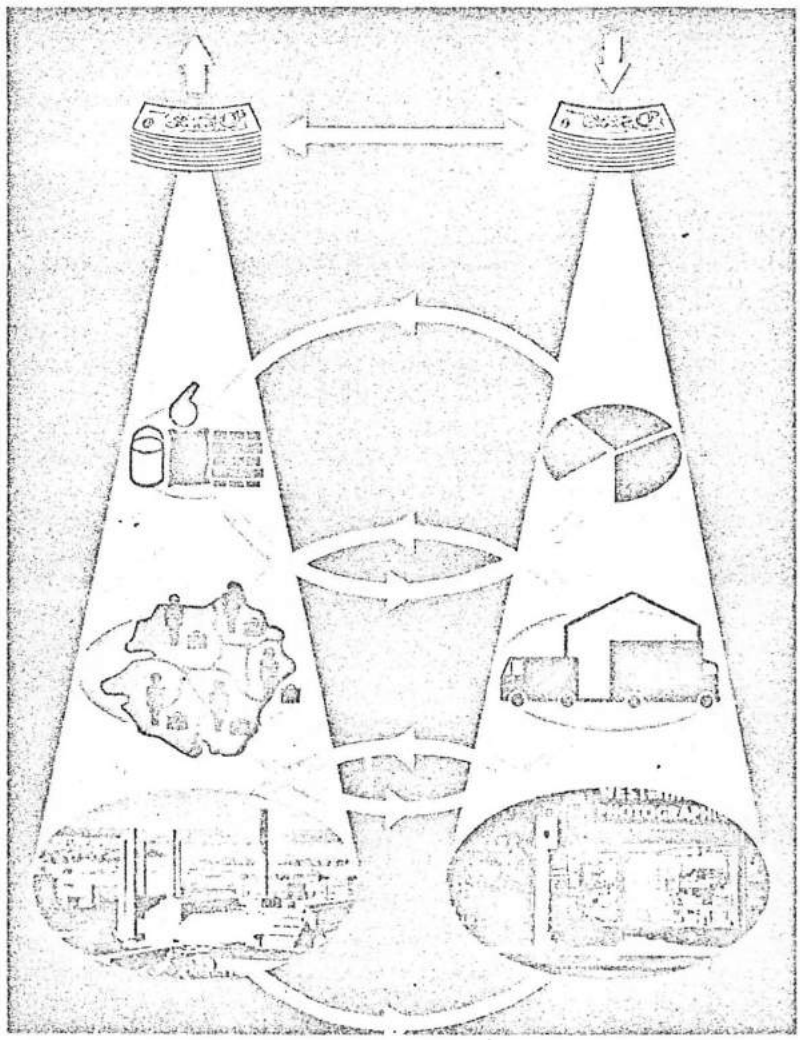
2.4.4 The use of information

In order to illustrate the points of view made so far, and to illustrate this general operation of abstractness, Figure 6 shows Beer's (1967) "model of the modelling process itself."

In the diagram there is a picture of the company interacting with its market, and every degree of coarseness and fineness in the modelling possibilities is in principle shown. This may be claimed due to a pinpoint model at the top, having no resolution (in the optical sense of the word) and the fully resolved complexity of real life at the bottom. Every level of resolution may be passed on the way down. Thus the diagram is called the cones of resolution.

FIGURE 6

The Cones of Resolution (Beer, 1967)



For some purposes comparison of cash income with expense (at the top level) adequately describes the interaction of a company with its market. For other purposes the proportion of income derived from each product is relevant, for others the number of trade representatives, etc., is required, and so on down the cone of resolution until we come to the actual company and the market.

At the apex of the two cones, the model is "very-very-many-to-one"; there are two points, each of which is interacting with the other. However, this is not much use unless the value attached to each point is known. An example of this is the profit and loss account. The single point representing the market has a measure attached to it: turnover.

To work down through the two cones of resolution enables greater understanding of what is really happening. At the ground level, is the uniquely isomorphic model: the company interacting with the market. However, the further down the cones, the more complex the model.

"The pinpoint model at the top of the cones of resolution can be created for a given company at lunch, on the back of an envelope, by asking the financial director what the figures are. As the scientist descends the cone in his search for understanding of the total system, his task gets bigger and bigger. Clearly the most economic way to do management science is to stay as high up in the cone of resolution as one can." Beer, 1967.

PART III

RESULTS

In this book there will be no statistics.

F. C. Bartlett (1932)

3.1 The Basis of the Method of Approach:
Task and Skill as the Basis of Training Design.

3.2 The Method

3.2.1 The Interview: In Theory

3.2.2 The Approach

3.3 The Questions

3.4 The Responses

3.1 The Basis of the Method of Approach: Task and Skill as the Basis of Training Design

Three fundamentally different approaches to personnel problems have developed within industrial psychology (Ackoff, 1960). The first, personnel psychology, is primarily concerned with selecting the right man for a specified job. Its principal activity, therefore, is directed towards specifying the relevant characteristics of a job, determining which individual properties are related to its performance, and selecting those individuals who are best equipped for the job. The personnel psychologist, therefore, takes the task to be done as fixed and varies the men.

The personnel psychologist is also interested in modifying man so that he is better capable of performing the task. He attempts such modification through education and training. Here he partially overlaps with, for example, the industrial engineer who tries to modify the behaviour of man more directly. On the basis of time and motion studies the industrial engineer attempts to optimise a person's movements in completing an operation. The personnel psychologist tends to concentrate on communication and decision making.

The second psychological approach is that of the human engineer. The human engineer tries to modify the job to be done so that it can be done better by the people available to do it. Here the personnel are taken to be fixed and the task is taken to be variable. Hence, human engineers, like industrial engineers are concerned with the acts to be performed, but they try to modify them through the design of the equipment involved in these tasks.

A third psychological approach takes both the man and the job to be fixed, but the psychological and social environment to be variable. This type of approach yields studies of motivation, incentive systems, interpersonal relationships, group identification or alienation, and the effect of such variables on human productivity, job satisfaction and morale.

The approach used here is based on systems design techniques proposed in Singleton (1967a) and further developed in Ferries (1967) and Singleton (1967b); and Singleton (1970).

Singleton (1967a) proposes an analysis of human performance requirements in the context of systems design. This is primarily for man-machine systems. (See Figure 7.)

The particular parts of this system design procedure that were developed here were Task analysis and Skill analysis. The place of task analysis and skill analysis in training are explained in Ferries (1967) and Singleton (1967b).

Analysis of tasks (what the individual manager does) and skills (how the task is done) may be seen as the technique used for obtaining a statement of what the job entails, and what the individual brings to the job in order to do it. A job in this sense consists of what has to be done, and how it is done, in order to fulfil the objectives of the system, or the organisation. Task analysis and Skill analysis may thus be seen as a pre-requisite to formulating criteria for training and selection.

FIGURE 7 Decisions in the System Design Approach (Singleton, 1967a)

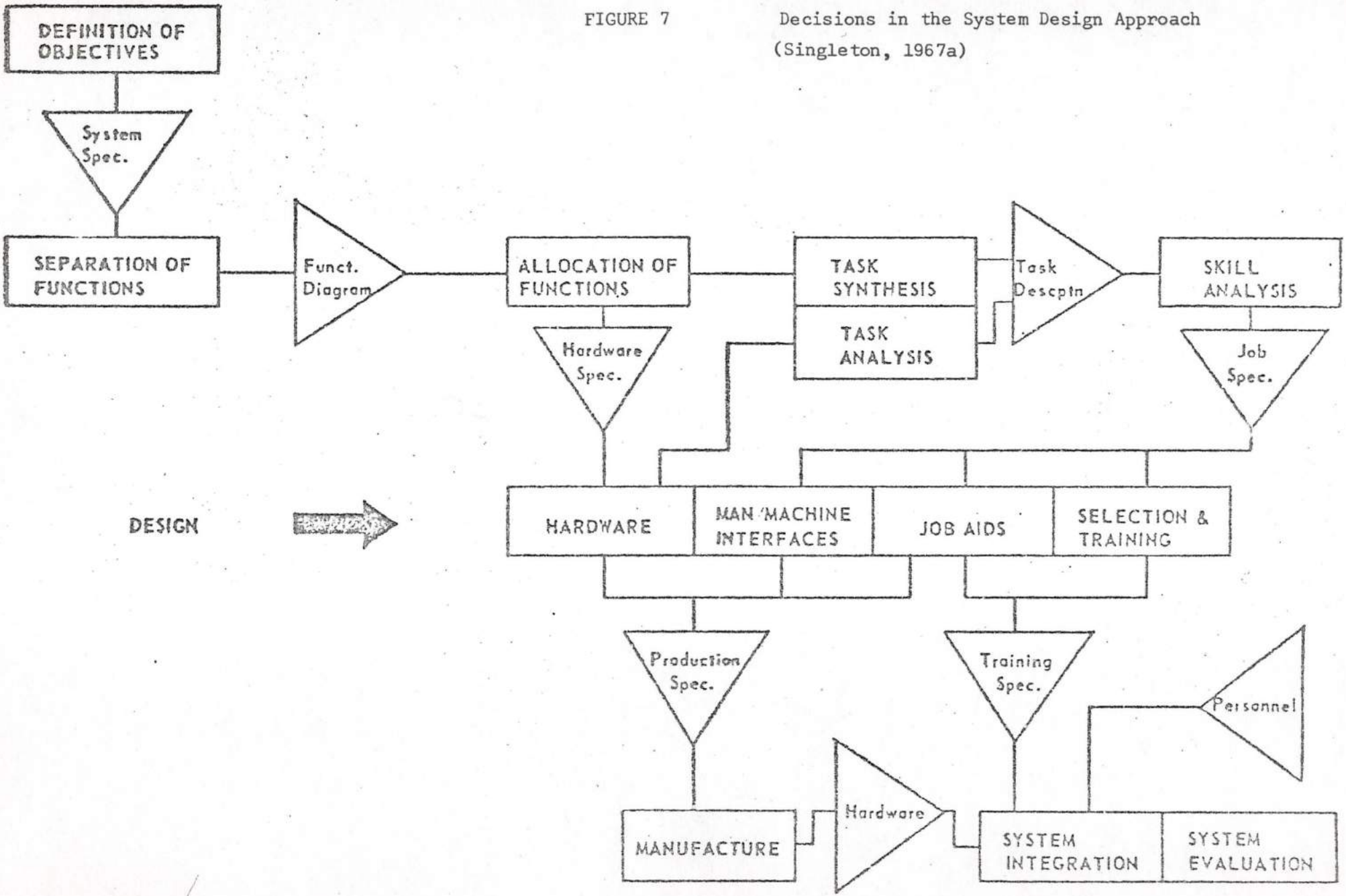


Figure 8 is Singleton's (1970) proposal for a task taxonomy and a capacity and ability taxonomy. The purpose of the taxonomic approach is put by Miller (1967) "a taxonomy is a means of classifying objects or phenomena in such a way that useful relationships among them are established". Thus Ferries (1967) from the task point of view, "the operator as part of a system has an input and an output, and he converts one into the other. He receives information and takes action as a result", and Singleton (1967b)

"Skills are not just special kinds of behaviour based on dexterity or apprentice schemes, they are the standard models and procedures which human beings use to adapt to and control the environment."

The aim here was not to generate a comprehensive description of what any management job is. To remember Simon's analogy in section 1.1, the management situation may be thought to consist of a number of pieces of cheese, where the maze is several orders of magnitude larger than the largest maze he could possibly explore. The managers job will more often be a result of the manager rather than the job. We must know how he solves problems in order to determine where he will go; we must understand what determines the paths he will try and what clues will make him continue along a path or go back.

From the point of view of this investigation, each individual manager will face quite different tasks, as well as using quite different skills to do the task. Description of a manager's job may be considered more complex than, for example, jobs that entail a higher degree of certainty in the environment, routine operations operating a machine tool. Thus, it was considered that tasks will be set by the individual rather than the organisation.

FIGURE 8

Proposed Task Taxonomy

Environment	Is protection required? e.g. footwear, glasses, goggles, suits, helmets, special chambers.
Output	How are the workers muscles aided? e.g. power available, methods of controlling and directing power.
Input	How are the workers senses aided? e.g. specialised lighting, sensors, displays.
Control	How is workers decision making aided? e.g. charts, algorithms, on-line computation.

Proposed Capacity and Ability Taxonomy

Capacities	Depending on endowment and maturation, e.g. visual acuity, physical work capacity.
Skills	Depending on learning and experience, e.g. specialised dexterous outputs, data sensitivity, language utilisation, mathematics, logic.
Disposition	Depending on endowment, up-bringing, education and training, e.g. punctuality, reliability, initiative.
Knowledge	Depending on education, training and experience, e.g. scientific training, geographical localities, sets of man-made rules

(Singleton, 1970.)

3.2 The Method

3.2.1 The interview, in theory

The interview is probably mans oldest and most often used device for obtaining information. It is a face to face interpersonal situation where one person, the interviewer, asks a person being interviewed, the respondent, questions designed to obtain answers pertinent to the purposes of the research problem (Kerlinger, 1964).

There are two broad types of interview: structured and unstructured or standardized and unstandardized (Maccoby and Maccoby, 1954). In the standardized interview the questions, their sequence, and their wording are fixed. An interviewer has little or no freedom to ask questions that have not been previously specified. Unstandardized interviews are much more flexible and open, which does not necessarily mean that they do not require as careful planning as the standardized interview. However, the interviewer has the opportunity to use alternate questions that he judges fit particular respondents in the interview.

The general tendency of experimental findings has been to show that even where the interviewing has been done by psychologists, interview judgements can be very variable and very unreliable. Hollingsworth (1929) showed, in an often quoted example of the value of the interview, that in an investigation in which fifty-seven candidates for posts as salesmen were all interviewed by twelve sales managers, a candidate who was placed first out of fifty-seven by one sales manager was placed fifty-seventh by another; the results were no better than chance.

However, Kerlinger (1964) points out "if the individual understudy has sounded his own desires, values and needs - and can express them verbally - the personal interview can be very valuable."

It is also of considerable importance in an interview situation that the person who is leading the interview, the interviewer, has an appreciation of the problems involved in human communication. The social scientist is concerned with the answer to the question, "Who said what to whom with what effect?" Since the general purpose of communication is to change the receiver's behaviour in some way, the message input is represented by the intention of the information source, that is by the person speaking. The clear understanding of the sender's intentions represents the output. The perceived behaviour of the receiver provides the sender with feedback concerning the accuracy with which his message has been received. Figure 7 gives a basic model of human communication (Lopez, 1965).

In communications among people, noise takes on proportions of greater significance and amplitude than in the communications engineering model. The strength of a signal can be reduced materially not only by the physical phenomena as sound, light, heat, a hard chair, a high carbon-dioxide content in the air, or a low blood sugar level in the receiver, but by the psychological effects of nervous tension, anxiety, emotional stress and insecurity and by the social and cultural impact of ethnic differences, class consciousness, social customs and individual habits. An interviewer must rely on his own experience and understanding to develop sensitivity to the subtle but distinct cues given to him by the interviewee that enable him to gauge just how accurately he is transmitting and receiving information.

The filter in Figure 7 represent the individuals' perceptual screens through which all information must pass.

"The filtering process consists simply of the sum total of an individual's felt needs, prior experience, attitudes, and his self concept. Every message sent or received is always referred to this

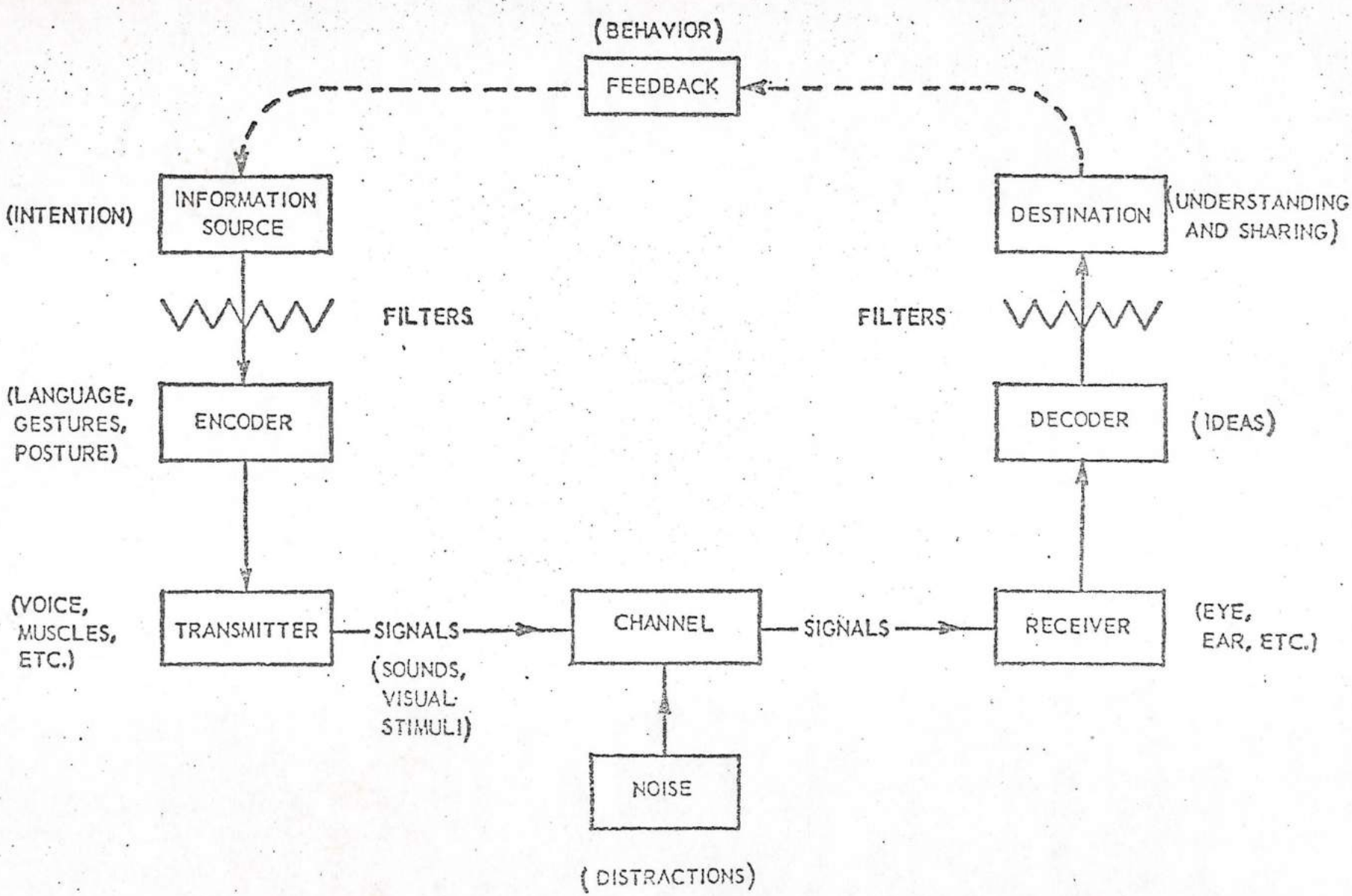


FIG. 9 The basic model of human communication.
Lopez (1965)

psychological field for meaning and relation to the self, and unless a message can be so related, it will be treated as ambiguous or meaningless. The interviewer, therefore, must clearly anticipate the influence of the filtering process in at least three aspects: perception, retention and semantics." (Lopez, 1965.)

3.2.2 The approach

Initial suggestions of managers who may be willing to be interviewed came from people at the university. An initial letter was sent out which stated:

"Dear Sir,

I am writing to you on the suggestion of ..... in order to ask if you could help me in a research project.

My research is into the skills of decision making. My approach is to try and identify the particular individual manner in which this process is organised by different managers in industry.

I would be extremely grateful if you could spare me some time in August to talk about your work.

If you are interested, and are able to spare the time, may I come along to see you briefly, in order to explain my proposals in a little more detail."

This was all the subject was told of the form of the investigation until the interviews were completed.

Thirteen of the replies were then followed up by a preliminary meeting, at the managers office. This was usually arranged by telephone. The preliminary meeting was considered as important for the interviewer (E) as it was for the manager, in order to have some idea of how to talk later.

At the preliminary interview, it was proposed to interview the manager in two separate sessions of one hour's duration, with about one week's interval, and there was a preliminary discussion about broad aspects of his job. This preliminary meeting lasted from fifteen to forty-five minutes.

The main interviews were recorded. The tape recorder's presence did not appear to affect the responses. Managers were assured of the confidential

nature of the tapes. The interviews were usually in the manager's office, or a convenient room nearby.

E had before him the broad structure of the interview, as shown in Figure 10, 1 and 2 constituted the structure of the first interview, 3 and 4 the structure of the second. Some paper was necessary for notes on points to follow up that were relevant to the particular subject (S).

In the first interview questions were oriented towards identifying the way the individual thought about his job. The first interview was essentially oriented towards task aspects - the job from the point of view of the organisation, as interpreted by S.

It was not considered practical to interview a manager in terms that would have identified his broad area of activity for him. For example, an analysis of basic decision types (see Figure 11) may be understood by management theorists, but individual managers in practice would have their own 'schema' for the types and areas of decision making and the interrelations between them. The aim was to identify the level of abstraction seen by the manager as his task, rather than to impose a level of abstraction onto him by assuming what decision making activity he chose to undertake in his position of responsibility could be as abstractly put as 'control' or 'organizing'. What, in practice, did the decisions entail; what is a control decision?

For an example of individual differences in management practice, control may be implemented by a decision rule set to a particular accounting ratio. Not every manager will use accounting ratios, and not every manager will use the same accounting ratios. The individual system of control decisions

FIGURE 10

The Structure of the Interview

1. Organisational Objectives

2. Task Taxonomy:

ENVIRONMENT	e.g. office
OUTPUT	e.g. decisions
INPUT	e.g. sources of information
CONTROL	e.g. people reporting direct

3. 'Personal' Objectives

4. Skill Taxonomy:

DIMENSIONS	e.g. knowledge
DIMENSIONAL SCALE VALUES	e.g. capacity (for discernment)
COMPARISON RULES	e.g. anaolgies and techniques
STRUCTURE FOR GENERATING COMPLEX RELATIONSHIPS	e.g. disposition, orientation

FIGURE II Interrelations Among Basic Decision Types

Richards and Greenlaw (1966)

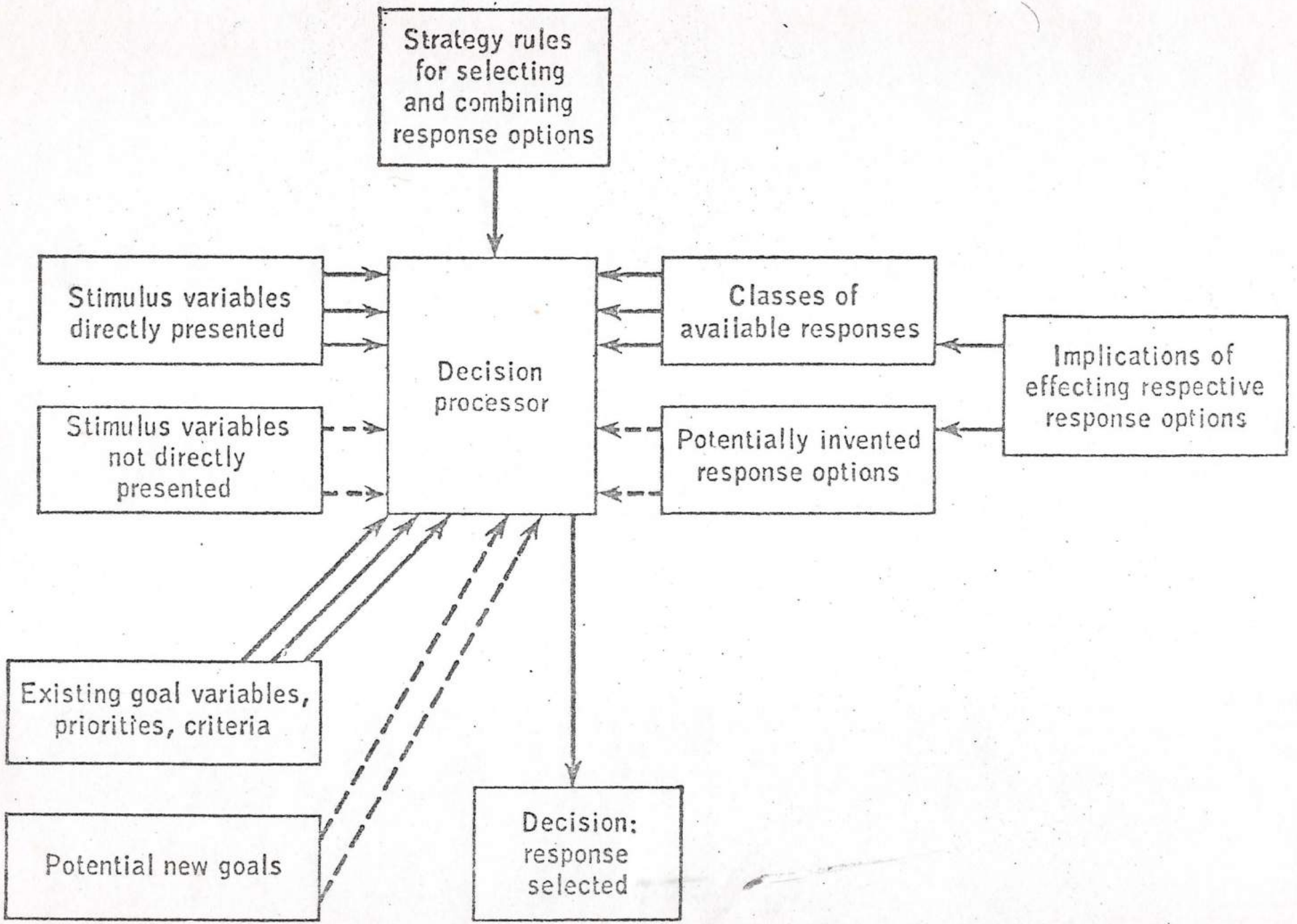


Figure 12 Decision making: classes of information required. Miller (1963)

will vary considerably, according to the extent of the individual manager's freedom. Because organizational control decisions have been laid down and made routine does not mean that each manager will not have his own ideas about what is to be done to keep a check on progress.

The E, however, must have in mind the background to the sort of decision making activity necessary for success (staying in business) in order to identify the significance of individual's responses, and to produce a relevant response.

In order to communicate in the interview, E must be able to converse in the same language as the S. This will entail having a background knowledge of how managers in various situations have to operate. Figure 12 is an illustration of the classes of information required in a decision situation (Miller, 1963).

The second interview ranged much wider. Essentially, it was a discussion about anything that 'the subject had spent time considering' or 'had spent time thinking about'. It was not specifically intended to be relevant to the job but was more oriented towards hearing 'how' the S thought about any subject that he was familiar with. This requires somewhat less of a background knowledge as an ability to ask relevant questions on diverse subjects.

The questioning was oriented towards getting S to think. One way to do this is to ask 'what do you mean' or 'could you explain in more detail' on the various aspects that were brought up from the starting points given in Figure 10.

For example, one means of identifying how the manager saw his environment was to ask how he spent his time, and then go into his division in more and more detail.

E's task could often be seen as questioning the rationale behind S's thoughts in order to discover it, in a manner that motivated S to do so.

The role of experience in interviewing cannot be gone into in too great a detail, but there are similarities between the concepts presented here as relevant to decision making, and their relevance to the interview situation.

3.3 The Questions

Schroder et. al. comment:

"At this stage, we have applied the manual to verbal responses generated by (a) incomplete sentence stems; (b) incongruent adjectives as a stimulus for impression formation; (c) answers to essay questions on a psychology examination; and (d) a request for the specification of environmental factors relevant for decision making by individuals and groups. In general, we have found that stimulus situations implying conflict, uncertainty, and control in a given domain produce more relevant responses in terms of the manual."

In practice, the interviewing developed a fairly distinct pattern of questioning that superceded the intended structure, which still served as a useful background. It was necessary to identify the dimensions, or areas, of an individual managers concern, before it was possible to question him regarding the conceptual integration of these areas. It must also be considered that a more formal discussion of such broad questions as "How do you spend your time?" - which served as the most useful starting point in the first interview, will serve as an instrument for helping the manager to begin the process of questioning himself.

Most of the first interviews consisted of questions directed at facts rather than the reasons behind the facts. Most managers were able to relate what in fact they did during a typical day, whether it varied a great deal, or whether it was put over in the form of relating his own job description, (if one existed). Questions were thus directed at formal details from the job to the personal history and background of the individual manager. It was considered more important to investigate in depth any particular aspect of the job that came up than to gain a comprehensive coverage of the job. In management, this is difficult.

The second interview was started with a question directed at talking about

something that the manager had spent some time considering. Some examples were suggested, for example religion, politics, a hobby, an outside interest. It was attempted to investigate whether the subjects discussed were relevant to the job. Sometimes, the subject was closely related, at others only indirectly or not at all. The questions here were directed at putting another point of view to the point of view expressed, or other questions directed at attempting to identify the basis of a person's interests, actions or beliefs.

The most important requirement for this form of interview, however, is not necessarily the particular questions, but providing conditions that allow S to speak his mind.

3.4 The Responses

In the introduction to the general manual for scoring structural properties of responses (see Appendix 2) Schroder et al (1967) comment:

"These descriptions are theoretical, and the rater must learn to translate responses into scores representing levels of conceptual structure. It would be impossible to provide a manual that would list all types of responses falling at each level. Certain specific examples can be given; but at this stage, the major requirement of reliable and valid scoring is a thorough grasp of the theoretical variables describing structural variation and a consideration of each response in these terms."

No attempt is made here to 'measure' the level of conceptual integration of a particular response. The emphasis here is to try and identify the structural variables that are theoretically at the basis of integration.

"Structural variables measure the nature of the relationship between a person and the objects in his world. Consequently, in any area - political, religious, interpersonal - of the life space we can measure the level, or the integrative complexity of the conceptual rules for processing information. In higher level structures with more rules and interconnecting linkages, the individual has more ways to relate to persons and objects and to generate new aspects of relating." (Schroder et al., 1967)

Reitmen (1965) comments:

"At their core, concepts of cognitive structure refer to representations of the environment. Any organism that behaves adaptively will have such a representation."

Bartlett (1958) proposed that thinking, at least in the first analysis, can be usefully regarded as a complex and high level skill. Thinking, and the lower level skills, such as sensori-motor performance, have a number of important common features, both possess a directional quality in that they move toward a specific goal or solution, both show some

improvement with practice and both involve, either directly or indirectly, the uptake of information from the environment and its emission in the form of a response.

Wright et al (1970) conclude a discussion on sensori-motor skill with the comment:

"The human operator may be usefully regarded as a single channel communication system, whose capacity for receiving, processing, storing and acting upon information is limited. .... The acquisition of skill can be seen to a large extent as a process of reorganizing the input data through the appreciation of redundancy and the selection of key cues, so that it can be handled most efficiently by the limited channel mechanism."

Where thinking is concerned, the input and output may be considered as from the 'internal' environment of the organism as opposed to the external environment.

Bartlett (1947) distinguished three characteristics of skill:

i) The importance of timing as opposed to time, and the related overlapping of the constituent items of the skill.

ii) The integration of input or output items into larger groups which are treated as units.

iii) The need to recognize the key features and their changes during learning. Key features may be objectives or input or output items; their common factor is that they are the anchor points for the structure of the skill in space and time.

The structural variables which are of concern here may be seen as key features, or anchor points in the process of response. The response itself is a representation in verbal form of a higher level skill in which symbols (such as words, numbers, shapes, colours, tones) largely

replace bodily movements.

The responses that are presented here are examples of actual responses made by the subjects in order to illustrate the type of question and its response considered relevant to the attempt to identify the structural variables. Various phrases are underlined as being relevant to the characteristics of the structural variables.

S1

The response here developed out of the question

"How much responsibility do you exercise for how information is put together" and "do you check back?"

"After long years of experience you tend to get of feel for figures, if you are a figure minded man, for example, I was fortunate to have a good maths master at school who taught us always to check an answer a different way round. In find that this is invaluable: this is training that is instilled in my mind; I never look at a figure, a graph or a chart without automatically, my mind sort of questions the figure - does it look right."

And the feel from experience, have you any idea how this is evolved?

"Well a lot of it depends on training at school. I thinks it's a very good thing to have a financially trained mind, that automatically trains you to query figures.

And the biggest problem in, ...in, ...in any management job is that you can never rely on information that comes to you. This is a fact, and I think that anyone sitting in a chair like this must say exactly the same. Information that comes to him, everyday of his life, he finds many things that are wrong with it. You're very lucky if you have got someone below you who is looking at things with the same sort of eye as you are, and is therefore preventing mistakes from reaching you. They are few and far between. You would be surprised how few people have got this facility of looking at figures and facts and saying - Do they look right?

I had a very good example this morning. A young chap brought me some cash information, I queried it. He came back later and said yes there was; but he still had it wrong. He hadn't thought about it."

What do you mean by a financial mind?

"Well a financial mind is rather like an enquiring mind; a financially trained mind is usually an enquiring mind. By financial I don't mean book-keeping."

You mean this head for figures? Can you mean by a head for figures?

"Well, the ability to look at a ... a number of figures and understand what they mean, without just looking at those figures. To look at a cost build up and look upon that as being material; labour; overhead rather than 40 + 15 + 20; and seeing if your material comes out at being 40, and your previous recollection of it was 30, knowing why it is now 40.

This is the sort of thing that comes to you after a period of time, after you've become used to handling these figures. I think it is the reason why a number of people don't make a success of management, they haven't

got the ability to see through to the end of a set of figures or a set of facts."

A later response was on how to deal with problems that arose when S found what he considered a point for discussion.

"On overseas contract, where I was perhaps uncertain, and bear in mind that the managing director was sales oriented, whereas I am profit oriented, so my view was different very often simply because I looked more at the ability to make the profit than the ability to make the sales. I think it is a fault with many sales oriented people they are concerned with turnover and perhaps not quite so much with profit."

This is your own personal criterion or objective.

"Yes I believe the objective of almost every company is to maximise its return on assets employed. It's no good getting a huge turnover if you make no profit on it ....."

What sort of form did the bargain take, what sort of information was used?

"Sales levels, cost levels, additional spread of turnover over overheads, greater utilisation of existing assets. I have always found that areas of not enough information was on credit - the cost of this was not being taken into account. This is an aspect that sales oriented people don't take into account, but nowadays with interest rates being so high, this is a very significant part of your costs.

In any presentation given to you, I always take the view that you don't believe anything - believe is the wrong word - you don't take at its face value everything that's sent to you, particularly by anybody that's sales oriented. (Laughter.)

It's my experience that everybody tries to sell you on their own pet idea; it's not intentional, it's psychological, and I think that they can't avoid overstating their case."

S2

(S was relating a personal background at school where he switched from arts to sciences.)

Do you think this has benefited you, seeing life from both sides?

"Very much so."

Can you give me an example?

"I think the grounding in arts, particularly English literature and English language, and reading a lot of novels gave me an appreciation of what is needed to communicate; to write good reports; to understand reports that are written and to understand, I think, the real meaning of words, which is a very noticeable lack in many science graduates. They don't understand how precisely you need to think of what you are going to say. Besides you need to structure what you are going to say to communicate properly. This is a large problem in industry, certainly, people don't ever think about the communications problem properly."

Do you mean that what you say may have a completely different meaning to somebody else?

"I am thinking of the whole problem. I don't think people realise there are a number of steps in the whole process. First of all, there's the way your mind works anyway, whether your mind works logically or illogically. The first step is to be aware that the initiation process is in your own mind. Then there's the second step, translate the thought processes in your mind into speech. And then of course there's the effect of the speech on the person that is listening to you. And here's a third step where things can go wrong; if you don't speak properly, if your speech organs don't work properly, or the man's ears don't work properly, you can lose communication here.

And then there's the same steps in the opp..... in the man that is listening to you. He's got to translate it to his brain; his brain has got to work logically or illogically, then produce a response. It's an enormously complicated process.

I think a grounding in arts, in what words mean, has helped me to understand this communications problem - to - a reasonable extent."

How was this idea of communication developed?

"To some extent I had developed part of that idea myself - reading the odd book about it, thinking the odd book was - incomplete - giving it a

bit of time to think about it. I went to a talk the other day, a personnel director talked about a director getting over what he meant to his employees - just one little bit of the process, and he thought that he had covered the lot. This is appalling to me, that people in this position have never stopped to think, because unless you get the communications right you can't do anything else."

(Later, S2 related how his academic experience helped.)

What would you say was the benefit of your academic experience?

"It gives you a great many weapons to work with. I think a simple one is this structured approach. I can only speak as a technical science man; you are taught to apply - what I can only call a structured approach; for example in a scientific problem, you must clearly define the problem you are looking at; then you must define the methods by which you will attack this problem - line up your equipment, your methods, your apparatus and so on. Lay down a programme of what things you are going to tackle in order; then there's a period - step three - in which you are getting to spend time amassing facts. And the next step - step four - is to spend some time having got the facts - marshalling them, putting them into order and trying to create a picture from them. And the fifth step is to say, right now, I've seen this picture, have I got enough facts to form this picture, and I am going to think about it. I am going to deduce something from it. Step 5, no step 6, is to now do something with the decisions you've made - progress to another experiment or to put a course of action into effect."

S3

What would you say your job consisted of?

"My job, primarily, is to mould an effective machine. A manager has to perceive and define objectives. He has to be fairly single minded in pursueing them. He needs to have a high degree of integrity; (pause) he has to be prepared to compromise when compromise is necessary; and above all he has to do all the work without becoming emotionally involved in the issues. He must be an intelligent animal."

What is an intelligent animal?

"Oh, it's a recognisable thing .... you would know better than I do, how effectively you could measure it. (Laughter) I would define a manager as a man with a fairly high degree of curiosity, imagination, and a sound deductive capacity; the ability to relate cause to effect and perceive the likely outcomes of courses of actions - before embarking on them and not half way through. And to be capable of grasping things which are unfamiliar quickly and making reasonable value judgements about them. These sort of things...."

What about experience?

"Experience is no use without the basic abilities...."

Are you aware of any rules which you have for qualifying information which comes to your notice, for example, one reason why you read one report a little more carefully than another?

"I don't think I would be aware of, of consciously establishing a set of rules to sort out whether the thing is important or not. I think one tends to make judgements about these."

Would you say they are more or less intuitive?

"Well, I mean, one picks up anything that requires action. One divides things into action, things and information, things I think. And the information things are lower priority than the action things. Some sorts of information things are lower priority than others .... There is no shortage of information .... The biggest problem that executives have to live with is trying to absorb the amount of information that comes into their offices quickly and effectively enough .... The problem is finding time to keep up with it."

Do you follow any particular line of information?

"I follow all the lines of information I can find time for, but, primarily I am concerned with information which relates .... if you like management theory and personnel practices rather than technical activities per se."

S3 (cont.)

(The second interview consisted of a detailed account of the management worker problem. Strikes were of some considerable concern.)

".... one could probably write a couple of foolscap sheets on the sort of environmental constraints or environmental expectations which surround you in an industrial situation. And then we try to pretend that we are surprised when people on the shop floor do not behave in a manner which accords with the pattern of expectations of the management, whose environmental constraints are quite different. The next thing one could raise is the difficulty of communication. Er, again, Professor Abercrombie does a very good lecture on the difference between communication and perception, very relevant. If someone communicates, people to whom the communication is about, will interpret the communication, again, in terms of the expectations of their environment or point of view. The message that they will draw from the communication may be totally different from that which the communicator intended to imply.

Something else, I might have mentioned this before. We are in the process of introducing a new supervisory structure, to make supervision more effective. Now all sorts of interesting things happen. Now, you can talk to people on the shop floor and there is a normal expectation of promotion to greater security, hopefully into the ranks of supervision, or management, or chairman. However, to make this new supervisory system work we had to recruit some new supervisors. As soon as we explained what we were doing to the shop stewards, two interesting things happened. The shop stewards said 'this is an attempt by management to introduce job evaluation by the back door'. And this really happened.... Their perception of their situation is completely different...."

(And later)

"Industrial relations is something that you wish somebody would get off your bloody neck so you could get on with the job!"

Would it be suitable then, to appoint someone to take care of this?

"No it wouldn't; one does this, there is a whole department for this. When you get down to the grass roots the thing that matters is not that somebody has to do the work. The thing that matters is the relationship between the man and his boss."

S4

How do you spend your time?

"Well, I have never kept a record, and I wouldn't like to think. I suspect that I spend much of my time doing notherin, although it is not unprofitable. No, most of the time I keep out of the way. There is a job to be done to make sure it all functions."

Would you say it was a job of keeping the momentum going? -

"In the end your principal job can be seen as two separate things - one, to indicate the general direction of movement that the firm is going to take, and two, to sort out the problems of personalities that crop up. It's a matter of keeping the machine going and sorting out the various crossed lines."

Can you elaborate on what you mean by movement?

"This would be a matter of keeping things going in the right direction. Normally one doesn't interfere with the marketing manager in his line operation, how he chooses to do it. The policy is set out and his job is to carry it out and carry the can if anything goes wrong. I expect to be told of the plan of operations and if it conflicts with what experience says is right, I tell him."

What form does experience usually take?

"Experience is quite simply what did or did not work at some time past."

Do you have anything to help you in your long-run thinking?

"No, native intelligence."

Can you say what you mean, is it experience?

"It is very difficult to put a value on experience. Very often its just pure hunch. A hunch mustn't be mistaken for just a guess. (Pause) Its a considered opinion arrived at by sub-conscious means based on experience. You don't know how you arrive at it. It is just that experience leads you to think so and so is going to happen. For instance, with the rate of incoming orders, you compare it with the normal flow that you know is what to expect. You can tell from the look of orders whether it was good or bad trade. If you noticed that something was moving - size and type of orders are the usual cue. It is purely and simply experience."

S5

(At the start of the second interview.)

This time I want to range a little wider, and instead of concentrating on you and your job, concentrate on yourself. In the way of discussing your attitudes and opinions towards various things; what in fact you might have spent a lot of time considering, thinking out or thinking over, whether it be religion, or whether it be politics, or whether it be an interest developed in some depth, in whatever comes to mind.

"I find it difficult to identify any one particular thing. I suppose, ... its interesting to note that I don't think you can put in a watertight compartment your, or its very hard, your political beliefs, and segregate these from your business activities or the way you like. I think the political with a big P, in this sense, ... is a way that people find to manifest their own inner beliefs, e.g. I find it hard to imagine how anyone that professes to be a christian can believe in a society which is completely based on free enterprise, on the other hand, in a business area, in the market place, it is a very ruthless existence; and even in a society like ours where there are many many controls, and in a compnay like ours where there are many many constraints, it is true to say that you have to be aggressive in going after the things you know are important to the business, and this is about the only anomally that I really see. I never stop to think of the individuals that you may in fact be affecting. When I am after a contract, or trying to get into a new market, the - my mind is virtually closed to all aspects except the impact it could have on the social environment here within this company, or within the area. In other words, my total concern is to make sure that the people for whom I am responsible, have an opportunity to earn their bread and butter. In fact, more than that, my ambition is to see that they have the opportunity to earn the highest wages - to get economic satisfaction to the point where they can't look elsewhere and say 'Well I am working like a slave here for very little money, whereas if I worked in the ..... industry I could work half as hard and earn twice as much .....'

And also, the second part, although its a much more difficult part, is to enable them to get social satisfaction, you know, psychological satisfaction in the work that they are doing .....

Industrial unrest is perhaps my pre-occupation when I am thinking about any action I am taking in the production area, industrial unrest is just below the surface. It is manifestly present, but only becomes overt for the most peculiar reasons. It only flashes to the fore when

it - something triggers it off - a change which hasn't been communicated properly, e.g. ..... the last straw - letting off steam - You have got to watch the degree of incipient boiling as I see it."

S6

What do you understand by management?

"Well, the best understanding I can give you is the one that the British Institute of management uses. It's the art of getting things done through people. You have to organise people to the agreed aim."

Would you say that your job was largely one of human relations?

"Human relations? Um, yes."

Could you think of a particular wituation where you had to take a decision in this area? What sort of approach did you take; is it a problem of adjudicating?

"Adjudicate? Well, I don't know; I can't bring one to mind. I remember that appointing my personal assistant to the job of production control was controversial. No, I knew he was liked and that he would be helped by the others. It was a case of engineering the change tactfully and slowly. It's rather like a sideways move done in the army where you create a new job."

(Then at the start of the second interview.)

"One tends to keep off religion and politics, particularly if one lives in Northern Ireland. It's very difficult to know what to do right there; because I spent 2½ years there during the war, so consequently I got to know a lot about the way the 'Northern' Irishman, at any rate, ticks. We found ourselves, in the army, when we were there, getting to the stage where we could almost tell what the religion of somebody was by looking at him. You get a sort of 6th sense for this...."

Can you go into this; how was it done?

"I don't think I know how it was done. (Pause) Maybe it was what they talked about... I can't help feeling in some ways that it would be better to do away with the Northern Ireland Parliament and treat the place ... as much more part of this country but...you know, it's awfully easy to talk absolute nonsense about this when one doesn't know enough about the ins and outs and the actual technical difficulties of doing this ....

When I was there I was all for suppressing the Catholics, and freezing them out if possible, but obviously that is not on.... I have become more broad minded I suppose. As one gets older one gets less militant - automatically I think less fixed in my ideas. I suppose some people might say you get more fixed as you get older. It depends which way you look at it."

S7

Can you say what it is about your job that interests you.

"People; administration; feeling that, in this hard and sometimes squalid world of industry people really do matter. There are plenty of people around who watch the material and financial aspects of it. Again, without being soft or sentimental, because on has fully subscribed to the view that industry in society is a profit making activity, and its got to be run on hard commercial and industrial lines. You have got to have people in with the concern, that people should be properly looked after. And the company does not become too hard and tough in the wrong sort of way. You know, with some mergers and take-overs we have had recently it has appeared that people just don't matter at all."

Do you know what makes you so interested in people?

"I think this stems from being an active churchgoer, a practising christian, educated in the humanities, steeped in the classics. .... One ought to be able to stand back a bit from the battle and ask oneself what is this really all about."

In the second interview, discussion centred around religion.

".... christianity provides a framework for ones life. The better a christian one tries to be, the more one refers all ones points of conduct to ones basic beliefs. (The denomination) is to some extent coincidental. I am a (denomination) because I feel it provides a rational and reasonably liberal approach to christianity .... one is obviously very interested in and accepts the fruits of modern scholarship and the way in which the Bible has been analysed and one realises some parts of the Bible are more valuable than others ...."

Can you elaborate on what you mean by basic christianity?

Well, this of course would take all day to discuss but basically, one has to adopt a certain basic philosophy of life, and mine is a philosophy that accepts the fact that there is a God ... Any philosophy that excludes this concept of God seems to me to be incomplete .... It is ultimately a matter of faith .... taking the fields in which human intuition seems to reach its highest levels, I find this in the Bible.

S8

Have you, in your job, any sort of rules that have developed?

"Little ones, certainly. I like to be punctual for appointments, I like other people to be on time for appointments. Life gets disorganized otherwise. I like to combine this with a flexibility about seeing the other people here, but I am thinking particularly of external people. Secondly, I like to start early in the morning, it's refreshing then. Third, I like to deal with those things that need dealing with, and to push out of my mind what there is no point in dealing with now. Fourth, I think there is a certain stage, maybe once a week where I have got to say I won't go home until that is done. I won't go back until I have finished with it. I think one has to have a discipline of this sort. I believe in deadlines of this kind. I impose them on myself, I don't always honour them, but I impose them. And lastly, I think, not to miss the unexpected, to follow up the curious, and the interesting - who knows where it will go, not to follow it so much so that you are the kind of man that if there is anything intriguing about it, you can't neglect it, and neglect what is important. And then the last thing is to try and find some time, always within the week or the month, to say to myself, what am I doing, and what ought I to do about that one - to avoid the danger that you are always putting out fires, as I have said, routine drives out planning. I think those are the only conscious rules I can think of off hand. I don't like my desk cluttered."

The topic of religion, although it may be considered very personal, it would appear to take up much 'thinking' time in some people's attitudes to how they try and form their own behaviour.

Thus, in the second interview ....

"I am very interested in religion. I was brought up in a very religious atmosphere.... I am not as observant as I perhaps should be. (The religion) presentes problems as a minority religion in what is essentially a christian community, though many people of course are not terribly christian. (The religion) is a religion which turns to a high degree on detailed observance, some of which I am good about, and some of which very bad. And it turns on this, if you like, code of living, rather than on, if you like, theology, philosophy and dogma. In fact, to discuss within the context of (The religion) does God exist is not really a serious question. (The religion) starts from the proposition that God exists and the problem is how to behave in relation. What does it mean when I say I believe God exists; does it mean I have some conviction, or does it not have some relation to the way I live or say I should live."

S9

At the start of the second interview.

Now I would like to move a little wider; I would like you to talk about something you have thought a lot about, from religion to politics to philosophy to anything - any hobby horse?

"Yes, there are a number of things which, in a sense, I think, although they might on the surface appear to be different, they spring from the same thing. If one looks, if one has tried to formulate one's ideas, one thinks of it in terms of oneself and other people, what marks people out as likely to be able to get on in industry today. I think I believe at this given moment in time, and my ideas may alter, I think, this word sensitivity to me means a hell of a lot. By this I mean awareness, for instance in communication, for example... it's no good you understanding what you are on about... if you are trying to influence something you have got to understand the foundations, why a certain situation has arisen. And this means putting yourself in the other guy's shoes....

It could be in a certain situation where pressures have built up, say in the negotiating situation that a man has dealt very adequately with a situation and there comes the point when you are about to tie up a certain deal, and he reaches the point of no return, the pressure is too great on him. Another thing too, we have to look at, and there may well be physical analogies here too, a man may well be able, in a very narrow field to withstand a hell of a lot of pressure, but if you increase his responsibility in management terms, what he's got to be able to do is not to withstand pressure over a narrow front, and in depth, but he has got to be able to operate a lot of strings at once - he has got to have capacity, he's not got to be overwhelmed or thrown by a lot of things happening at once. He has got to be able to make a decision, to delegate, to utilise his own time. The group dynamics situation enables you to do this in a very raw, very exposed way, to be able to marshall your own resources, to deal with highly personal situations. And the analogy is there in industry, where if you like you are dealing with systems .... Sensitivity, awareness and maturity are all part of the same thing....

Now, having recognised this, and I believe this very strongly, I think this governs any approach to development and the way we look at people and, if you like, the way we try and isolate potential. Now, I believe this very strongly."

S10

Do you spend any of your spare time on the job?

"At the moment, yes, with this training scheme, its really the first thing I have had to grapple with. This has involved drawing up a training programme, timetables, devising a system of monitoring the trainees' progress; and this needs writing up, you see, because it's not happened before, so you have got to write it all down so that people know about it, and then discuss it with the people that have got to operate the system."

Where have you got this information from, for this thing?

"Well, it has just been common sense really; I haven't been involved before in any training. It has been dictated by (1) the training needs of the Company, which is obviously the primary, and (2) there is the training board whose requirements I knew something about in fairly skeletal terms, and I've had to take advice and read a lot of highly boring documents. There's nothing terribly difficult about it really - you've just got to use your loaf ....

I had to decide fairly quickly: I was presented with a folder after I had been here a week which said these eight trainees are starting with us, they are all yours. And I looked at what had been done in the past, and what we had in the past was a list of names meshed together with the departments they had to visit. So I had to elaborate; put some shine, take off the rough edges - elaborate. .... The thing has been done on a firefighting basis so far - very much on a day to day basis."

(Later)

How do you approach an interview?

"If I was interviewing someone for a vacant position as a secretary and I thought, if I got any inkling, that whe was a sensitive, easily upset, or slightly inexperienced character, or if I had any doubts about her confidence then although she fitted the job specification, then I would say at the back of my head, 'No!' because, I would have in mind the personality of the man that she would work for. This is something like the Irish religion problem."

S11

(In discussing his future career)

What would you say that you needed in terms of - experience - to do a foreman's job?

"The basic thing that I would need is control of labour."

Control of labour?

"Yes, you know, how to 'control' people. I think there is a wrong way and a right way in how to control people and how to talk to people. How to make people work for you."

Why do you think this?

"I think you have to look at individuals and how individuals work. You can go up to one person and outright saying you've got to do so and so and he'll do it. You can go up to another person and say exactly the same thing and he'll tell you where to go. Whereas, if you approach him in the correct line he'll do it for you. Er, as I say, another type of person, you can go and directly tell him to do a thing and he'll say yes, but you know very well he won't do it, you know he'll just not bother because you approached him in the wrong attitude, whereas other ways, you can be polite to a person and he'll do anything for you ....

In other aspects, if you work with people for quite a while it is difficult to order people what to do."

How, why do you think this? Is this just your own idea of, er, your own view of yourself and the sort of job you're after?

"I think I have picked this up from people I've worked with."

".... other aspects of football I talk about was the resignation of Peter Knowles. To my mind, he was a really good footballer, brilliant at times, but he must have lacked a bit up top."

Why's that?

"Well, I can't understand anyone joining a club like the - well - a faith like the Jehovah's Witnesses, cos, I am not particularly bothered about christianity anyway. To my mind the Jehovah's witnesses are a load of rubbish, cos I don't believe in what they preach, cos Knowles was a brilliant footballer ...."

How do you discuss about Knowles?

"Well a good many used to run him down because of his antics, there were eruptions over Knowles, and the things that he's done. One match he would play a blinder, and the next he would just beat a player three times to annoy him. If he mucked around I would criticise him, but I would still rate him as a good player."

(Later)

What about rules?

"Rules are made, and they are made for a purpose, and there is the old fashioned saying 'Rules made to be broken'. When you are young you do break them, and when you get older, you learn to know why they are put there; they are put there for a meaning. They are not put there as things people dream up. They are designed for a special purpose. The older you get the more you appreciate this."

S12

(In relating how he preferred to keep 'scrap' products down to 1%

rather than the normal 6% of the products coming off the line.)

"... I am so dependent on my memory, although I can assure you we don't miss too much.... Even though I am 99% certain I don't like to rely on memory, so I use a book to remind me."

Is it entirely up to you how you organize the process?

"I am responsible - yes - . If I don't do it they will just go through bad - the wrong size, wrong shape, wrong everything. Nobody else will take it up to check, there's no double check. .... I keep these graphs and control charts."

(There followed a list and description of them.)

Did they exist before you came?

"No, the chap who was before me I never knew; I took over from him and I scrapped a lot of the stuff that he had done. What he used to do was keep a chart on the machine.... that's no good I want charts." (He then went on to explain how he believed his system was an improvement.)

What experience are you lacking for doing the foreman's job?

"I think primarily, I don't think the education I had was up to scratch; apart from one or two subjects I was only just above average. My father says I lack confidence in myself. I want to know what I am talking about when I talk to people. I would be lost if they put me in another shop. I think a lot of trouble is caused by putting a supervisor in charge of somethin where he doesn't know what he is doing. He has come from some obscure office; he's never had any shop floor experience. Now, I can talk to a bloke on the shop floor, in his language, the same as I can talk to any director or factory manager here. I can apply the language the bloke understands; I can swear as good as he can. They use lingo the management probably never use; you know, I can, I understand, they call things by different names to what they should be called. It's pointless to say you should never argue with anybody - not so much argue as have a debate. Now chaps will argue with me as to what's right and what's wrong, I'll stand there and explain to him why that's scrap rather than walk away. I don't believe in that. I'll explain to an operator why that's scrap because he needs to know.

S13

This response developed out of S's thoughts on the question of how satisfied was he with his present job.

"I find as I get older it gets harder, or do I lack the ambition again to get any higher, that's the point, that's how I view this.

I've done a pretty good job - or I have a pretty good job.

Have I the capabilities of going on to a foreman?

And then the question crops up - my ability - again - if I'm asked to do things a foreman is asked to do or work out the things he's asked to do. Shall I fail? This is where I think the decision is a bit too great because I think I may not succeed.

I may succeed in one way in regard to planning and organizing the department and having the experience of it but when you reach the foreman status you meet the higher management and you've got to talk on the problems for higher than what I know them at in my sphere."

And the problems are in what sense?

"Mathematical, you know percentages, analysis sheets, and things like that, this is where I would fail. If I make a wrong decision I would take the blame. My father used to say 'You can learn all you can at school cos you'd never learn it out of school and I always believe that's a sound policy."

And what about experience?

"Experience, yes, that counts in a long way, the experience of learning anything. But you must have all the groundwork of experience as well as in the grey matter - all the basic work. It's no good working off a little, and hope you'll get by with it cos you'll get found out."

And what does this basic groundwork consist of?

"Well, whatever it consists of what your doing. A little of knowledge is all very well, providing you are only applying it in a little way. But when you take a broader scope on it, that little bit of knowledge is lost. You want the real basic things, I mean, Birmingham University that's going further ahead and looking farther afield. My narrow field as I look at it, in my eyes, is my ability that I have got, I think, anyway, you know."

PART IV

DISCUSSION

Men imagine that their minds have command of language; but it often happens that language bears rule over their minds.

Bacon

4.1 The Interviews

4.2 Selection, Training and Developing

4.3 Management Information Systems

4.1 The Interviews

In the rapidly expanding technology of our society, development and training have almost become synonymous with the acquisition of knowledge and skills. In overemphasising the importance of the information a person learns, there is too little attention paid to the ways people learn to combine or use information for adaptive purposes. Given the same amount of information, different people use different conceptual rules in thinking, deciding and interrelating. A sharp distinction can be made between what a person thinks and how he thinks. Thus in management decision making, experience is needed in order to provide a fund of information generating conceptual rules, in order to help understand new situations that the manager will be faced with. Experience is a fund of models enabling the individual manager to bring his experience to bear. This is not to say that experience is all that is necessary for satisfactory performance. The models that a present day manager must understand are usually of considerable sophistication.

The attempt here was to try and produce an interview situation that would enable some identification of how an individual manager would bring his experience to bear; what his experience had taught him about the best way to do his job, which may be seen in the broad context of decision making, and whether the approach developed by Schroder et. al. (1967) would help in clarifying differences between responses.

Thus, it might be expected that managers in an ambiguous situation would exhibit more abstractness in their thinking about their job than managers in a less ambiguous situation. For example, S1 explains his attitude of never trusting figures, and S12 is able to give a detailed account of a complex system of charts, and other systems for processing information that he has set

up in his work. S13 comments that, a disadvantage was to never come to terms with abstract concepts such as a percentage, but, however, he was well able to deal with people, which entails abstract thinking of a different kind, (being able to'put oneself in the other person's shoes').

The problem of communication is especially relevant to industry, and understanding of the problem is not necessarily limited to higher management. However, it is probably one of the areas of management activity that requires most experience, and where the relevance of the Schroder et. al. (1967) framework may be seen to be more relevant.

The responses that were presented were chosen for their actual content as well as their relevance to the possibility of generating the structural variables of the Schroder et. al. (1967) framework in an interview situation. However, in examining the responses for the structural variables only, the content is relatively unimportant. The content of the selected responses is in order to illustrate something of the nature of the management job in terms of 'abstract' thinking. In the sample shown, one cannot claim that they are representative; however, this may be due to the tentative nature of the interviewing as much as the possibilities of examining certain management problems in terms of requiring abstract thinking, in the context of the Schroder et. al. (1967) framework.

It is difficult to infer whether the replies of the managers presented can be seen to suggest anything significant other than further investigation may be worthwhile.

To be of some practical use, as opposed to helping understanding, the terms

'structure' and 'abstractness' must be more clearly defined. Rather like 'experience' and 'system', they involve difficulties in where to identify the boundaries between the many meanings of the term. However, a problem may not be solved without having been proposed.

The initial framework proposed by Schroder et. al. (1967) is developed to a greater extent in order to attempt to allow for, for example, motivating effects, and also changes in information processing structures through time, and in different environmental situations (stress and complexity). One important aspect of complexity may be that the level of environmental complexity presented to a subject in a training situation may be an important factor in his performance.

More immediate application may be possible in developing the approach put here in such situations as the interviewing of graduates for management posts. Their background may be more suited to the necessary interviewing approach, which requires the subject examining his past experience to respond to questions in verbal form. If it is possible to develop a suitably standard interview, the verbal responses of various subjects may be compared for their structural characteristics, if this is held to be relevant for satisfactory performance in managerial situations. The interviews and ideas presented here would suggest this.

However, it may be considered by an experienced interviewer that he knows what he is looking for - even if it is difficult to explain in exact detail.

4.2 Training Selection and Development

"In our review of current practices for selecting and promoting managers, it was apparent that nearly all decisions are based on personal interviews or on judgements made from knowledge of a manager's past job performance.

Little research has been directed toward understanding more fully what goes on in personnel interviews, and few efforts have been made to improve their usefulness for predicting managerial effectiveness. .... Further, no research has been done on the relationship between a man's past performance and his future managerial performance, and we have no research evidence bearing on the implicit or explicit processes used by a superior when he tries to estimate a subordinate's future effectiveness on the basis of his current performance." (Campbell, 1970)

Campbell et al (1970) emphasise that research into management selection, training and development is inadequate. In practice, rather as decisions still get taken, selection training and development programmes are still introduced. It may be considered more desirable, however, that current practice should be built on research findings wherever possible.

In practice, companies devote most of their training to the areas concerned with specific knowledge and techniques such as accounting, business law, personnel management and computer programming. Yet the training research that is done is concerned with the direct inter-personal problems, for example the T group.

The objectives of this kind of training are summarised by Campbell et al. (1970) as:

1. To give the trainee an understanding of how and why he acts toward other people as he does and of the way in which he affects them.
2. To provide some insights into why other people act the way they do.
3. To teach the participants how to listen, that is, actually hear what other people are saying rather than concentrating on a reply.

4. To provide insights concerning how groups operate and what sort of processes groups go through under certain conditions.
5. To foster an increased tolerance and understanding of the behaviour of others.
6. To provide a setting in which an individual can try out new ways of interacting with people and receive feedback as to how these new ways affect them.

The objectives of the T group can be seen as increasing the level of conceptual integration with regard to people, which form one of the most ambiguous problems for a manager; again dealing with people, and deciding how to deal with different people is not a problem that the individual manager can ignore.

However, T group research is still inadequate. However much of a blunt instrument this method may be, its objectives would appear to have interesting similarities to the concepts presented here. People present an individual manager with information in the same way as statistics. The modelling process in an attempt to understand the situation, in order to decide the correct course of action may be considered similar.

As well as attempting to increase the comprehension of the two person communication problem, T group and work by Driver and Streufert (1969) has been aimed at understanding problems in multi person communication, i.e. groups.

4.3 Management Information Systems

The individual manager is important to the organization in two ways. He will set the objectives that the organisation will follow, and he will decide on the short cuts to be taken when it is not possible to cope with the difficulties entailed in complexity and change. When information about the environment is incomplete, the manager must decide which information is relevant.

(This is not to ignore the developing tendency towards group decisions in management, but a group does consist of basically individuals who decide on some manner what influence to bring to bear. Some of the information the individual takes into account may well be derived from the group processes.)

Edwards et al (1965) give an account of the relevance of information processing to decision making systems. The problem may be seen as the substitution of the increasing potential for quantity of information derived from modern technology for the information of the required quality; to make large quantities of information only peripherally related to the problem in mind substitute for small quantities of information speaking directly to that problem. An example of the relevance of this can be seen in the problem of what commercial competitors have decided to do.

Edwards et al (1965) comment:

"The tool that (the manager) uses to interpret that mass of information is exactly the same tool that Alexander the Great used to perform the same task: his own trained and experienced intelligence."

Edwards et al (1965) then develop their concept of a Bayesian information processing system, a man-machine system that attempts to overcome man's inability to cope with vast quantities of information.

In an attempt to tailor information to the manager's objectives rather than the system's objectives, Ackoff (1967) comments:

"Most management-information system designers 'determine' what information is needed by asking what information they would like to have. This is based on the assumption that managers know what information they need and want.

For a manager to know what information he needs, he must be aware of each type of decision he should make (as well as does) and he must have an adequate model of each. These conditions are seldom satisfied. Most managers have some conception of at least some of the types they must make. Their conceptions, however, are likely to be deficient in a very critical way, a way that follows from an important principle of scientific economy: the less we understand a phenomenon, the more variables we require to explain it. Hence, the manager who does not understand the phenomenon he controls plays it safe and with respect to information, wants 'everything'. The management-information system designer, who has even less understanding of the relevant phenomenon than the manager, tries to provide even more than everything. He thereby increases what is already an overload of irrelevant information."

From the point of view of the approach to decision making developed here, a manager would do best to understand his idiosyncrasies, derived from his particular experience, and combine this with an understanding of the necessary information for his tasks, concerned with taking decisions. To the extent that a manager is allowed freedom to determine what are the problem areas in the organization, information would gain in quality from being tailored to the manager's understanding of the situation, so long as the manager does understand the nature rather than the detail of his task.

P A R T V

CONCLUSIONS

If the doors of perception were cleansed,

everything would appear to man as it truly is, infinite.

William Blake

An attempt has been made here to develop some ideas, and to see whether they have any relevance to present day problems. It would appear from a very cursory testing of the concepts that there is some potential for further development along the lines presented here. The interview is a valuable tool that can be put to diverse uses connected with understanding human behaviour. It has been allowed to suffer criticism for a considerable period, criticism that has been of a more negative than positive nature. Despite lack of formal understanding, the interview remains one of the most commonly used tools of investigation in management selection (Porter, 1966).

"The fitting of terms from past experience to incoming data is part of the process of giving them 'meaning'. .... It would seem that in every-day perception we unconsciously use various methods to build up a kind of running hypothesis constantly predicting a little ahead of events. .... The result of this continual short term prediction is that when incoming data are familiar they are identified and fitted into context immediately and without any intervention of consciousness. When, however, data are novel or unexpected, there seems to be an active search for terms of past experience which are fitting or appropriate, and there may be use of images, searching for analogies, and a considerable amount of trial and rejection before satisfaction is reached. .... The past experience brought to deal with any incoming signal seems not to consist of an aggregate of past impressions, but appears to be in an organized or schematized form which is affected by each new impression in a manner which can be compared to a 'plastic' model." Welford (1958).

Thus, in identifying the role of experience in management decision making, one can make a distinction between the experience in terms of what will be familiar and experience in the terms of what is available in the active search for interpreting new experience. In the Schroder et al (1967) framework the former can be seen in dimensions and dimensional scale values, the latter in comparison rules, and structures for generating complex relationships. To the extent that 'new experience' is part of the task of management, the latter may be an important feature of the required skill. If new experience is not necessarily an important feature of the task, then a rigid, as opposed to a 'plastic' schema may be more

suitable.

No attempt has been made here to formalise a task description, or a skills analysis in any detail, but there would again appear to be some potential for formalising the manager's job in such a way using an abstract-concrete continuum, for example, the levels of operation required in Beer's (1967) cones of resolution, and the capability of a person to follow these levels through without regard to formal concrete existence.

As regards the relation of task and skill, Revans (1968) writes:

"Management is a symbiosis; the manager in changing the world is in turn changed by it, and the manager who is unwilling to be changed by what he does will find himself unable much to affect the world about him. ....A managing director organizes his world, and the world organizes the managing director. It may be easier to discuss the symbiosis solely from the manager's standpoint, but this, like the heliocentric theory, is only an arrogant convenience. If the manager does not want the world to change him, or is unable to let it do so, then the system is no complete symbiosis. He cannot therefore use his full influence to do what he otherwise would be able to do. .... The man of action, unaware of his own need to be changed by the outcome of his action, is the man least motivated to effect that action. The manager unable to learn from his own experience, in other words, is the manager incapable of reorganizing the system that offers him that experience. .... "

Insight into learning from experience and the situations where this is vital, as well as being afforded by the concepts developed by Schroder et al (1967), may be further emphasised by Anstey (1966) commenting on the kinds of criteria used in psychological tests.

"A fascinating analysis of the reasons why some people succeed in business and others fail was made by Professor D. J. Van Lennep in an article published in Progress, a Unilever publication in 1962. He stressed the importance of self awareness, which enables a person to cultivate what he can do best and not strive after what he is not capable of. And he commented that many successful people seem to have had frequent good luck, while others are 'accident prone'. Successful people are not all thrusters but they have been ready to grasp the initiative when an opportunity presented itself. In trying to spot such people selectors must pay regard to a candidate's potentiality to develop, and to his will to meet the demands made by the work."

However, motivation is a subject that is outside the context of the approach presented here.

P A R T V I

PERSPECTIVE

In the most fundamental sense, all learning is self learning.

R. M. Gagne (1966)

6.1 Introduction

6.2 Intelligence

6.3 Personality

6.4 Perception and Experience

6.5 Skill

6.1 Introduction

This section is an attempt to relate the approach put here to some of the traditional fields of investigation developed in academic psychology.

The traditional areas of work on individual differences can be seen in the considerable literature on 'intelligence' and 'personality'.

However, it must not be forgotten that the study of psychology is very closely related to the study of the physiological basis of human organism. The comments on Perception and Experience attempt to emphasise that this must not be forgotten, yet there are difficulties in understanding the human organism at such a level that will not be fully understood for some time yet.

Section 6.5 is an account of an area of investigation that may eventually lead to an understanding of human performance that will allow some understanding of behaviour to be put to use in our time. The traditional dichotomy between nature or nurture may well be turned into a continuum which will allow the either-or problem to be resolved as a combination of both. For example, Witkin's (1962) work on field dependence and field independence may be seen as an attempt to understand human behaviour that is relevant to such an approach, by an examination of differences between individual perception in terms of 'self' and 'environment'.

6.2 Intelligence

According to Cyril Burt (1955), the term intelligence goes back to 'intelligentia', a term introduced by Cicero. Spearman (1927) reported that the 'monarchic' view of a unitary thing called intelligence was popular as far back as the fifteenth century. Both writers credit the bringing of the term into psychology to Herbert Spencer (1895) who had earlier emphasised its role in biology. Having defined life as "the continuous adjustment of internal relations to external relations". Spencer believed that adjustment is achieved by virtue of intelligence in man and by virtue of instincts in lower animals. Defining intelligence as the 'power of combining many separate impressions', Spencer also tried the concept to the doctrine of evolution that was to set the pattern for psychologists for many years to come.

However, as Guilford (1967) has pointed out, development of tests to measure intelligence has generally far outran the development of the understanding of that which tests have measured. Thus, Boring (1923) gives an essentially operational definition: "intelligence as a measurable capacity must at the start be defined as the capacity to do well in intelligence tests." In other words, Boring was saying that intelligence is whatever intelligence tests test. As Guilford (1967) comments ".. in this direction of extreme empiricism lies chaos".

Guilford (1967) gives an account of how intellectual aptitude tests in general came about along national lines - British, German, French and American. Tests have been of some concern longest in Great Britain, because of the development of Darwinism and its implications for individual differences. The British interest was first in the use of tests as a means to an end, the scientific study of individual differences

in connection with heredity. Later, with Spearman and Burt, interest turned to the fundamental nature of intelligence.

German interest, e.g. Ebbinghaus (1885) was largely prompted by the desire for instruments to be used in experimental studies of psychopathology and other psychological and educational problems, with little concern about theory. French concern was mostly practical; however, Binet was interested also in the nature of intelligence as well as testing. In the U.S.A., the most extensive use has been made of tests, in research and in practical affairs, however with rare pockets of concern about the nature of human abilities, e.g. Thorndike (1931) and Thurstone (1955).

Guilford (1967) comments

"Appearing often in definitions of intelligence is the statement that it is learning ability or the ability to learn." and

"The common relating of intelligence to 'adaptation to new situations' in some definitions suggests the relevance of learning, for adapting to new situations does imply learning." But he concludes that

"The very popular conception that intelligence is learning ability, and that it is a universal ability, regardless of the thing being learned, has definitely been exploded by a number of experiments."

Quite apart from the psychometric approach with psychological tests, Piaget (1947) has developed a rather different approach. His methods have been direct observation, with emphasis on intellectual development.

"The concept of development refers to the fact that changes in the nature and organization of an organism's structure and behaviour are systematically related to age in an orderly and lawful way." (Wright et al., 1970.)

Thus Wright (1970) comments in a brief summary of Piaget's approach:

"The development of intelligence in terms of the progressive modification, coordination and differentiation of schema can be described as follows. The biological drive to adapt to environment leads the child to assimilate the objects in that environment to his existing schemata. At the same time the nature of the environmental objects forces upon the child an accommodatory adjustment of these schemata. It is thus that schemata develop.

It follows that the complexity of schematic structure depends upon the variety of the environmental objects which are available for the child to assimilate and which simultaneously provoke accommodation. At a higher level, for example, when faced with a mechanical or mathematical problem, effective adaptation requires that assimilation-accommodation be so speeded up that it becomes internalised or symbolic, and that schemata be coordinated with each other in the sense that they assimilate and accommodate to each other and form complex systems."

In an attempt to discriminate among people with respect to the nature of their cognitive systems, Harvey et al. (1961) arrayed concepts along a concrete-abstract continuum. This formed the basis of the approach developed in Schroder et al. (1967). Harvey et al suggest that total cognitive schemes may be seen as arrayed along this concrete-abstract dimension so that people may be characterised as being at different positions along a concrete-abstract continuum in cognitive style. This dimension is not to be confused with a general intelligence scale. Rather, it describes tendencies toward abstract or concrete ways of thinking by which people of equal intelligence, as is conventionally measured, may be discriminated. The extremes of the continuum, in general terms, were defined as:

".. people with concrete cognitive schemes are unable to take an 'as if' attitude, tend to confuse wishes with reality, tend towards absolutism and categorical thinking, tend to be rule oriented and predisposed towards ritualism. The opposite end of the scale is marked by the ability to consciously and willfully take a mental position, to differentiate between outer and inner worlds, to plan ahead and to shift mentally from one aspect of the situation to another with ease."

Thus Schroder et al (1967) comment:

".. low and high level information-processing systems can be equally intelligent. If intelligence is measured by the amount of information known or by the degree to which learned rules can be invoked by certain cues, no matter how complex the rules, then the level of intelligence in higher and lower systems is not necessarlity different. High and low level structures can have an equal number of parts, or a low level system can have more parts (dimensions and rules) as in the case of a computer. But if intelligence is measured by the amount of ingormation that can be generated by new rule combinations, higher level information processing structures would be more intelligent."

6.3 Personality

Personality is another traditional area of investigation into individual differences in Psychology. From the nomothetic point of view the unique individual can be represented as the point of intersection of a number of quantitative variables. His position in this network identifies him uniquely, but this is not to deny that he shares many features of his behaviour with other people. Allport (1961) criticized this representation of the uniqueness of individual personality by pointing out that variables interact and cannot be regarded as completely independent. Both Cattell (1965) and Eysenck (1966) have acknowledged the need to investigate the interaction of traits.

Warr (1970) gives an account of research that attempts to go beyond the study of observed behaviour and offer an account of the mental events involved in an individuals experience. A distinction can be drawn between the content of a thought, belief or attitude and its non-content characteristics. Much work on personality, though and attitude has dealt with <u>what</u> a person thinks and wants (that is, with content variables) but it is also possible to enquire about <u>the way</u> in which he thinks or wants (that is, about variables of style). An example of this is shown in work on the authoritarian personality (Adorno et al., 1950) and dogmatism (Rokeach, 1954). Authoritarianism is measured in terms of <u>what</u> a person thinks and wants whereas dogmatism is more a question of <u>how</u> he thinks and wants.

The interdependence in personality of content and style (of what and how) may be difficult to separate but cognitive styles may be seen as habitual ways or modes of dealing with information about oneself and

ones environment which are to a large degree independent of the content of the information being handled.

Some styles of behaviour may be seen to be trans-situational (e.g. Kogan and Wallach, 1964 on risk taking, Mintz and Blum, 1949 on accident proneness and Janis and Hovland, 1959 on tendency to conform) but, this need not necessarily be so.

"The notions of style and structure is a statement about some kind of enduring entity, whereas a statement about style is more a statement about regularly observed consistencies in thinking." (Warr, 1970.)

The enduring entity which seems to be assumed by the notion of structure is usually thought of as a personality system or subsystem.

What is most common in discussions of structure is an emphasis on parts and interrelationships. This can be seen in discussions on groups and their structure (Katz and Kahn, 1966). In practice, structural notions have been used in personality theories for some time. Freud's psychoanalytic formulation was for example basically a structural account of mental organisation, dealing with the mind's major components (ego, super-ego and id) and their interrelationships (Freud, reprinted, 1965). In a somewhat different field, Bartlett's (1932) discussion of memory schemata was an examination of structural characteristics. Zajonc (1960) is another example in an examination of complexity, unity and differentiation in judgement.

Warr (1970) concludes:

"We need to know how the situation in which a person finds himself interacts with cognitive style and structure variables to determine his experience and behaviour. It is becoming apparent that cognitive styles extend only over a limited range of situations, so that a measure of style of structure (and indeed a more content loaded personality dimensions) is of restricted

predictive value. But the extent of these ranges of situations is at present far from clear. This leads to the paradox that psychology (which is usually seen as a study of people) must turn more to study environments and situations if its developmental momentum is not to be lost."

The work of Witkin et al. (1954, 1962) has emphasised the role of perception in personality and its implications for the approach of psychology.

"Recent research has demonstrated that people show characteristic, sefl consistent ways of functioning in their perceptual and intellectual activities. These cognitive styles, as they have come to be called appear to be manifestations in the cognitive sphere, of still broader dimensions of personal functioning which cut across diverse psychological areas. The fact that these broader dimensions may be 'picked up' in the persons cognitive activities in the form of cognitive styles, has an important methodological advantage. Cognitive styles may be evaluated by controlled laboratory procedures, thereby providing an experimental objective approach to personality study and assessment."
(Witkin, 1965)

6.4 Perception and Experience

"One of the most profound questions one can ask about perception is this: What role does experience play in the development and adaptations qua perceiver?" (Dodwell, 1970)

To put the question in the loser form: Does experience affect perception? The answer seems obvious. A person who has learned to classify butterflies, or styles of architecture, in one sense sees much more in the relevant situations than one not so trained. But we want to be able to describe how, and under what circumstances, experiences of particular sorts affect perceptual development, or perceptual change.

There have been - and to some extent there still are (see Dodwell, 1970) - two main schools of thought with quite different notions about the nature of perception, and of perceptual learning, development and adaptation. Both of them have their roots in systematic philosophical positions concerning the nature of knowledge. What distinguishes psychological from philosophical enquiry is the use of systematic observation and experiment in attempting to answer those questions and solve those problems.

The two major positions or schools of thought, have been the Empirical and Nativist (or intuitionist) schools. The first of these stems from the eighteenth century Empirical tradition in British Philosophy, the second from the Idealist (or intuitionis) theories of Fichte and Hegel. Put very crudely, the major difference between the two schools can be seen as: whereas the Empirical school held that our knowledge is <u>essentially</u> derived from experience, that experience forms our conceptions and knowledge of the world and all that is in it, the Intuitionists argued that at least some of the most fundamental concepts or categories of

knowledge are innate, and grasped intuitively by the mind, independently of experience. With some changes of emphasis, this developed into the nineteenth century battle between Helmholtz and Hering concerning the nature of perception.

Helmholtz (1866) believed that perceptual development involves an active constructive interplay between organism and environment, in which memory, thinking and perhaps other non-visual components play a part. The relation between the observer and his world is therefore presumed to be flexible to a degree, and subject to modification over time, although clearly not modifiable without restriction. The nativist position, on the other hand, holds that in some important respects the relation is a fixed one, and determined just by those characteristics of the organisms sensory apparatus with which it is born or which develop independently of external influences.

Denying the adequacy of atomistic or 'switchboard' theories of sensory input, Gestalt psychologists (e.g. Kohler, 1929) postulated the occurrence of sensory fields which are organized by innate cerebral mechanisms. This lead to the investigation of organisational characteristics of perception, and the physiological basis of the organizing mechanism.

Important work in the investigation of the physiological basis of perception in animals can be seen in Hubel and Wiesel (1962) with the discovery of the cortical coding system. This may be seen as establishing the point that the adult organism contains a highly organized, intricate and delicately balanced system for the coding of contour and pattern properties, which may be basically common to all mammals. "This has an important bearing on the question: is this an innate, built in, pre-wired system,

or is it something that develops only with experience." (Dodwell, 1970)

Dodwell (1970) comments:

"While the mammalian visual system has built into it the detectors for line orientations, the representations for patterns or shapes, or more precisely for concatenations of lines in different orientations, must be learned on associationistic principles - contiguity in time and space being the main ones."

6.5 Skill

The term 'skill' is used somewhat differently in industry and in psychology. In industry one asks what it is that differentiates between work which makes greater and lesser demands for training. However, a psychologist would be concerned with:

"How is complex performance organized and what is it that differentiates between more and less trained or expert levels." (Welford, 1958)

There is not so much a distinction between semi-skilled and unskilled grades of job, rather a distinction between motor, perceptual and cognitive skills. In manual skills the overt actions clearly form an essential part of the activity and without them the purpose of the skill as a whole would disappear. In mental skills, the overt actions play a more incidental part, serving rather to give expression to a skill than forming an essential part of it.

In spite of these differences, all skills appear to possess three characteristics (Welford, 1958).

1. They consist essentially of the building of an organized and co-ordinated activity in relation to an object or a situation and thus involve the whole chain of sensory, central and motor mechanisms which underlie performance.
2. They are learnt in that the understanding of an object or situation and the form of the action are built up gradually in the course of repeated experience.
3. They are serial in the sense that within the overall pattern of the skill many different processes or actions are ordered and co-ordinated in a temporal sequence.

Thus, Singleton (1967b) writes:

"The lower level skills are the motor ones which consist of routines for the control of actions. The information needed to exercise this control comes from the kinesthetic sense - the sense of position and movement. 'Low' of course is a relative term, it merely means that these skills are less complex than perceptual skills and many lower animals have these facilities as well or better developed than they are in human beings but still they are not necessarily simple in any sense. They are devices for the generation and sometimes elaborate patterns of output activity which do not depend on or require the conscious attention of the operator except that they are initiated and terminated by decision at the higher levels ....

The main basis of the versatility of human behaviour and incidentally the reason for our ascendancy over other animals is in the perceptual skills. As the name implies these are designed to cope with incoming information, to combine it with information already stored and thus to generate decisions, that is strategies, to deal with the outside world as its state is currently interpreted. .... Perceptual skills are probably best considered not so much as routines like motor skills but as models of the real world which can be manipulated to predict the consequences of certain actions and thus to determine the optimum actions ....

The real breakthrough in human behaviour came with the escape from (the) limiting mechanism (of sensory modalities) by the invention of symbols, that is things which express and recall objects or ideas but have no necessary topological correspondence with the aspects of the world which they represent. These higher levels of skill depend on the learning of languages which vary from simple alphabets (that is - collections of symbols with no interrelationship) to languages which depend on the combination of symbols according to semantic syntactic and progmatic conventions."

Welford (1968), commenting on the Gestalt concern to relate conscious perception to the physical 'structure' or 'patterning' of the stimulus continues:

"Bartlett (1932), however, in his studies emphasised from the start that perception was in a very real sense an activity of the whole organism, shaped not only by the objective stimuli but by the attitudes, interests, hopes, fears and experiences an individual brought to the situation; there is, he urged, an 'effort after meaning' which embraces far more than the dynamic interaction of various parts of a complex pattern of sensory stimulation. Bartlett's work was ahead of its time and anticipated in many important ways the modern treatment of perception in information theory and similar terms."

The term 'cognitive skill' has been used here to identify an area of skilled performance that is unique to an individual. Creativity may be

considered an example where 'perceptual skills' must be considered more in terms of 'proprioceptive' skills, the 'effort after meaning' that is the basis of individual behaviour, when physiological constraints are less significant.

APPENDIX I

APPENDIX 1

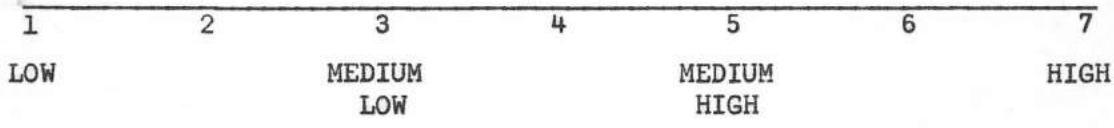
Levels of Information Processing (summarised from Schroder et. al. 1967)

Information processing refers to the nature and interdependence of conceptual rules available for organising dimensional values. One problem is to determine the number of dimensional attributes processed in an environment, and if two or more dimensional attributes of information are perceived, the next problem is to determine the degrees of freedom involved in the rules of combination.

For example, in thinking about international stimuli, one person may perceive two dimensions (capitalism-socialism and military strength-weakness) and another, three dimensions (adding autocracy-democracy). The second person perceives an additional dimensional scale value of information about a nation. But the number of dimensional attributes of information perceived has only a low order relationship to the level of information processing involved, and it can only be used as an operation under special circumstances. A person using two dimensions may be able to use them conjointly, combine them in different ways, and compare outcomes, while a person using three dimensions may use them independently in a compartmentalised way. The number of dimensions, taken alone then, has no necessary relationship to the level of information processing; but given complex combinatory rules, the potential for generating new attributes of information is higher, and the degree to which one stimulus can be discriminated from another is increased as the number of perceived dimensions increases.

Verbal responses are scored along a seven point scale. This scale represents a continuum from low to high levels of integrative complexity. At our

present level of knowledge, it is attempted to distinguish four points along this scale, at 1, 3, 5 and 7, and provide for a point of transition between each at 2, 4 and 6.



In order to identify the difference between conceptual levels, figures of the integration indices are shown. Simple (concrete) intervening structures are characterized by compartmentalisation and by a hierarchical integration of parts (rules). Regardless of the number of dimensions or the number of rules and procedures involved, the integrating structure is absolute. It lacks sets of alternate interacting parts. When the structure is hierarchical, the dimensional "readings" of a range of stimuli are organized in a fixed way. Some of the behavioural patterns generated by low integration index properties are: categorical, black-white thinking; minimizing of conflict; behaviour is controlled by external (as opposed to internal) stimulus conditions; the more absolute the rules of integration, the greater the generalization of functioning within a certain range, and the more abrupt or compartmentalized the change when it occurs, (subtle situational changes are not perceived).

One of the major requirements for the evolvement of abstract properties is the potential to generate alternate interpretations of a stimulus on any one dimension at a particular time. It is one thing to categorize a stimulus on one dimension under one set of conditions, but it is a different matter to

INTEGRATION INDICES Figure 13

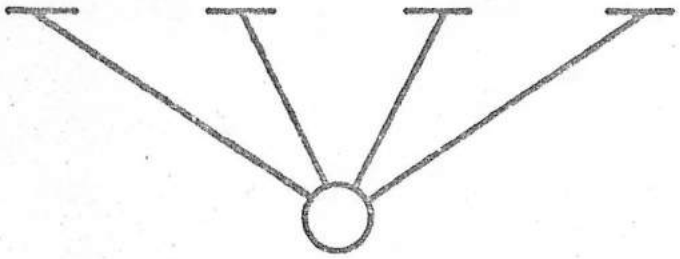


Figure 2.1 Low Integration Index

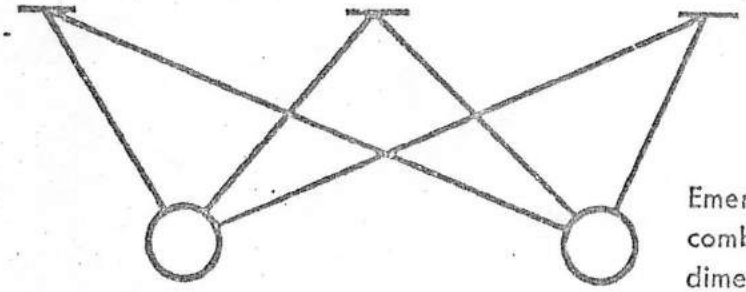


Figure 2.2 Moderately Low Integration Index

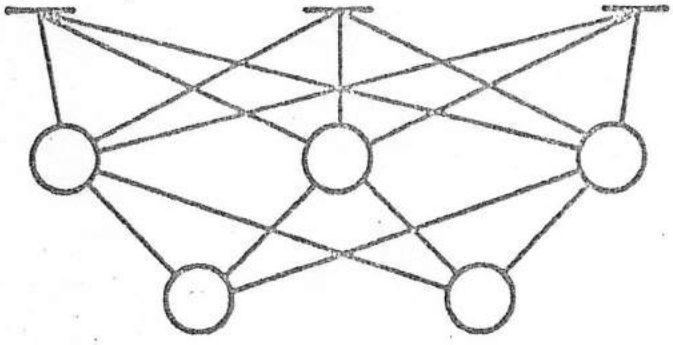


Figure 2.3 Moderately High Integration Index

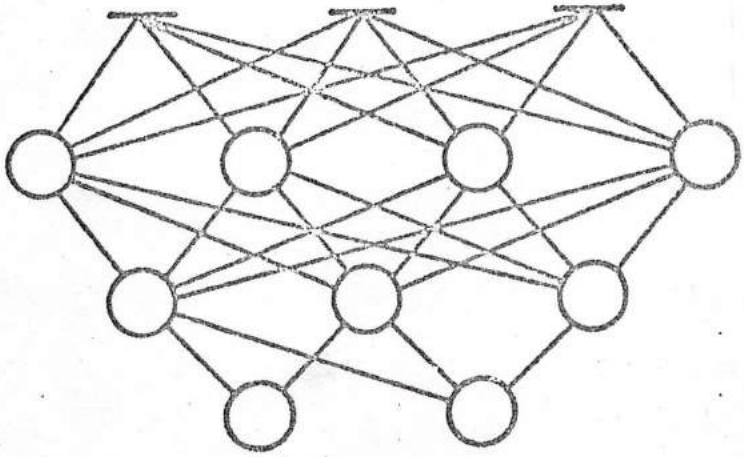


Figure 2.4 High Integration Index

interpret the same stimulus at two places on the same dimension by using alternate rules at the same time. In more abstract structure, more information is generated and evaluations are less fixed. Decisions can be - and are - made on the basis of more information, yet there is less certainty owing to the presence of conflict.

Some of the consequences of moderately low structural properties include: a movement away from absolution; the emergence of primitive internal causation; instability and non-commitment; a negativistic orientation.

Increasing levels of information processing involve the emergence of more complex and interrelated schema. In turn, more dimensions are generated, and discrimination between stimuli becomes more linear. If the adaptive significance of moderately low structure is the delineation of alternate rules, the significance of moderately high structure may be described as the initial emergence of rules for identifying more complex rules than alternation.

At this level, the person is able to combine schemata. In moderately low structure, the rules could not be effectively combined. At the minimum, moderately high levels of structure require rules for matching, comparing, and relating pairs of schemata.

Behavioural implications associated with moderately abstract properties are: the system is less deterministic; when system properties begin to permit the simultaneous utilization of two schemata the environment can be tracked in many more ways. A person who is functioning at this level may view a social situation in terms of two points of view, see one in relationship to the other, perceive the effects of one upon the other. He is also able to generate

strategic adjustment processes, in which the person observes the effects of his own behaviour from several points of view; he can simultaneously weigh the effects of taking different views. The presence of choice make possible the use of internal processes "self" is a causative agent.

While moderately high structure generates rules for comparing and combining the effects of specific pairs (or small groups) of schemata at a time, high level structure includes additional and more complex potentialities for organizing additional schemata in alternate ways. At the fourth level, comparison rules can be further integrated. Alternate complex combinations provide the potential for relating and comparing different systems of interacting variables. As with other system differences, the difference between the moderately high and the high levels is one of degree. In the latter, the potential to organize different structures of interacting schemata opens up the possibility of highly abstract functions.

In a very loose sense, and by analogy, the difference between moderately high and high levels may be described as the difference between an empirical and a theoretical outlook. At the moderately high level, a number of classes of empirical relationships are possible; in high level functioning, it is possible to generate or apply general laws that systematize a large and differentiated body of information generated by simpler schemata in various related ways. Unlike the low level, which consists of a hierarchical set of established rules and procedures, high-level functioning is characterized by the ability to generate the rules of the theory, the complex relations, and alternate schemata, as well as the relationships between the various structures. It has the potential to generate alternate patterns of complex interactions.

As with other levels, an increase in the number and complexity of the parts

of the mediating structure is accompanied by (a) an increase in the degree of diversity the system can handle and generate, in the number of schemata and dimensions, and in the complexity of their organization; (b) greater discrimination between stimuli within dimensions; and (c) an increased potential for the structure to generate alternate patterns of interaction and new schemata without the imposition of new external conditions. Internal processes can produce alternate organization of rules for viewing the world. These schemata can then be tested by exploration.

This very abstract orientation should be highly effective in adapting to a complex changing situation. It is certainly much more effective than a structure that is dependent upon external conditions for building rules and upon past experiences for predicting events. The effectiveness of high level properties would be maximized if the criteria of performance were based upon (a) the utilization of many interactive processes, and (b) the ability to cope with situational change over time. Highly abstract structure permits the delineation of many systematically related alternatives. If these can be kept in focus, decisions at a particular point in time should be most effective in adapting to a future event.

APPENDIX II

APPENDIX 2

General Manual For Scoring Structural Properties of Responses.

The scoring manual represents a set of general operations for inferring the level of conceptual structure that generated the response (Schroder et al., 1967). In inferring structural properties from verbal responses, the manual directs the rater to consider the degree of differentiation and the number of degrees of freedom in the rules of integration in the mediating processes underlying the response. For example, can it be inferred that the response was generated by a conceptual structure which failed to produce alternate interpretations (organizations) of the event.

The descriptions are theoretical, and the rater must learn to translate responses into scores representing the four levels of conceptual structure. Certain specific examples are given; but at this stage, the major requirement of reliable and valid scoring is a thorough grasp of the theoretical variables describing structural variation and a consideration of each response in these terms.

Low integration index

To assign this level, the rater must decide that the response could be generated by a single fixed rule, that no alternative interpretations were considered, and that subtle conditional changes would produce no changes in response. Responses that fit the event into a category (inclusion verses exclusion) with a high degree of certainty, that unambiguously reduce conflict and avoid the use of gradations (shades of gray and continua) are typically generated by simple structure.

More specific indications of a low integration index include (a) viewing

conflict, uncertainty, or ambiguity as unpleasant or as a flaw or weakness in people or functions; (b) seeking fast and unambiguous closure or resolution and reacting in such a way as to engage internally consistent processes that reduce incongruity or dissonance (Schroder and Crano, 1965); (c) offering a specific guide or rule for reducing conflict; (d) implying that an absolute solution can be found; (e) stating that effects are compartmentalized, are all one way or all another way; and (f) presenting only one side of a problem while ignoring differences and similarities with other views, e.g. responses to the stimulus word rules ....

1. "are made to be followed. They give direction to a project or life or anything. They should not be broken except in extreme circumstances."
2. "are made to govern society and to keep society from living in chaos. We also have enforcement agencies to make sure people follow rules. If they don't, punishment follows."

Medium low integration index

To receive a score of 3, the completion must clearly represent the availability of alternative rule structures for perceiving the event. The response must indicate the simultaneous generation of alternate and different perceptions of the same event. It may also include a conditional rule for specifying when each interpretation is used. Compared to the first level, conditionality, probability, and alternatives indicate a slight increase in the degrees of freedom involved. A score of 2 is given when the response signifies a qualification of an absolute rule (scored 1) but the qualification is not clearly identified as an alternative interpretation. Care should be taken to distinguish between a "polarity" response (inclusion in versus exclusion from a fixed category) representing a single rule and an alternative rule that would generate two different interpretations of the same event.

Specific operations include (a) the listing of similarities and differences

between views without considering relationships; (b) the specification of at least two different interpretations of the event in the sentence stem; (c) the presence of "either-or" type of responses expressing a possible conditional rule about two ways of categorizing; (d) probability statements about the occurrence of different views or outcomes; (e) reactions against absolutism in general (the possession of more than one view without the rejection of a particular view, which could indicate low-level, fixed-rule structure); (f) the avoidance of dependency on external imposition; in other words, the availability of alternatives. This last characteristic must be distinguished from opposition to a particular categorization, which can be generated by simple structures as exclusion and rejection.

Second-level structure can be associated with a "pushing against" orientation. The very fact of generating alternatives is related to a "negativistic" outlook in development. But in measurement it must be emphasized that negativity (being against a view) can also be generated by all other structural levels, particularly by low integration index levels. To be scored 3, a response must imply the presence of alternative interpretations regardless of the positivity or negativity of the response, e.g. responses to the stimulus word rules ....

1. "People seem to forget that rules are not ends in themselves. They were made by us, not created by their own will, for our benefit. People, for the most part, often don't see beyond the point of the rules, don't look for the underlying reasons."

2. "are usually made with the intention of doing someone or society some good. Often, over time, they become distorted and meaningless and too few people are helped by them. Then, if it cannot be easily enforced, it is virtually disregarded."

Medium high integration index

For a completion to be rated at the third level of conceptual structure, it must give evidence not only of alternative interpretations but also of the use of comparison rules for considering the joint as opposed to the con-

ditional outcome of these different perceptions. At this level differences can be held in focus simultaneously and viewed as having interactive effects. It would take considerable space and time for a paragraph completion to express two or more alternatives and to specify their joint operation. Subjects do not usually specify this set of steps in responding to sentence stems; instead they express the joint operation directly and the other processes must be inferred. The operations are more apparent in essays. A score of 4 is given when the rater is confident that the response implies alternate interpretations and also implies that both can interact, but the interaction is expressed as qualification rather than as the emergence of comparison rules.

More specific indications include (a) the integration of two conflicting or different interpretations so as to preserve and not "ward off " the conflict; (b) the generation of various meanings of alternate perceptions, such as various meanings of the perception of conflicting views about a person; (c) evidence that the completion implies the ability to take another person's intentions (or perspectives) into account and to relate different perceptions of different people; (d) the implication that one's behaviour is affected by the way another behaves, as in a give-and-take strategy game; (e) a view of social relationships as anchored in mutual responsibility (as opposed to fixed beliefs or rules), in which each person can "place himself in the other person's shoes" (relate alternate schema); and (f) (in essays) the consideration of alternate reasons for similarities and differences between views, e.g. responses to the stimulus word rules ....

1. "must be inspected before they are obeyed blindly. Obeying a 'bad' rule or law is perhaps worse than not obeying. If one obeys a 'bad' rule ('bad'-morally, socially, etc.), he gives it strength. Rules should be examined by society and changed, if necessary, by the process of law or obsolescence or enough people refusing to obey them publicly."

2. "are necessary for a society to function well. However, rules should not be so strictly adhered to that they cannot be modified when cir-

cumstances alter. The purpose or effects of rules are more important than the rules themselves."

High integration index

Completions are given a rating of 7 on this scale which not only state or imply that alternative perceptions occurred and were simultaneously held in focus and compared, but also indicate that the outcomes of various comparisons can be considered in producing causal statements about the functional relations between "ways of viewing the world". Such statements are relativistic rather than absolutistic and occur very infrequently in paragraph completion responses. Perhaps very few people use such complex rules of information processing outside the realm of science and philosophy. Even in these areas, special techniques have had to be evolved to assist us in such relational thinking. Responses that indicate the simultaneous operation of alternatives and give some evidence of the consideration of functional relations between them are given a score of 6. Specific references must usually be inferred because respondents seldom relate all steps in such thought processes. These include: (a) conflicting alternatives that are viewed as leading to new organizations and information; (b) utilization of alternatives through exploratory action in order to obtain new information; (c) generation of functional relations between alternatives; (d) consideration of relationships among similarities and differences between the sides of a problem or question, and development of relationships between alternate reasons as to why these differences and similarities exist; and (e) production of more "connectedness" between alternatives by theorizing as to why these reasons exist, e.g. responses to the stimulus word rules .....

1. "serve mankind and should be interpreted in terms of their ends, not their letter. They have a purpose both for the governed (keeping order) and for those who govern (order, maintaining status quo, etc.), which purpose can and perhaps should change from time and place and, hopefully, lead to a better, broader basis of understanding humans and making rules."

2. "are made for everyone but are interpreted in many ways. It depends on the point of view of the interpreter. It is in this very process of

interpretation that a society stays dynamic and changes and grows."

APPENDIX III

APPENDIX 3

An indication of the management situation faced by individual managers interviewed.

The manager's (S's) are ranked in terms of extent of authority and responsibility for people or resources. The rankings also coincide somewhat with experience in terms of years in management situations.

S1
S2 Responsibility was in terms of 1000's of people and £10's of millions of sales per annum and capital employed.
S3

S4
S5 Responsibility was in terms of 100's of people and millions of pounds of sales per annum and capital employed.
S6

S7
S8 Responsibility was 'staff' (as opposed to line management)
S9 in terms of hundreds of people (e.g. personnel responsibilities).
S10

S11
S12 Responsibility was more direct, thus supervision or sales administration.
S13

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