THE USE OF COMPUTERS AND INFORMATION SYSTEMS IN CORPORATE AND PROFIT CENTRE STRATEGIC PLANNING

S. L. Andersen

Rapporteurs : Mr. J. Arnott
Mr. J. S. Clowes
Mr. J. M. Rushby

Introduction

Dr. Andersen opened by defining his role within his employing company as that of a consultant or manager of a consulting group and pointed out that any opinions expressed would be personal and did not necessarily reflect the attitudes of his company. He indicated that he would use three approaches to his subject, namely :

(1) A personal approach, locating himself in the context of the events described.
(2) A discussion of selected case histories.
(3) A presentation of certain "conceptual frameworks".

Dr. Andersen then presented the following list, in historical order, of the types of problem upon which he had been consulted during his career.

(1) Design of laboratory and pilot plant experiments.
(2) Plant level experiments (that is, with operational plants).
(3) Operations Research.
(4) Venture Analysis.
(5) Profit Centre Management Information Systems.
(6) Corporate Planning Models.

As the consulting experience of Dr. Andersen and his group progressed through the above list, they experienced a growing feeling of increasing irrelevence as their clients within the company relied less and less on the results of analytical tools developed by the consultants. On reflection, they were able to discern three reasons for this:

(1) Models

In problem classes 1 and 2, there exists a well-defined set of candidate models which may be used for the analysis. These models include such technology as chemical kinetics, fluid flow and heat transfer. These models are universally accepted and are supported by a well developed body of theory. This situation no longer obtains when problems from class 4 onwards are addressed.

(2) Data

In problem classes 1 and 2, the main difficulties concerning data are those of collection and precision; in the latter problem classes, the difficulties encountered are much greater, as one is dealing with "soft data" (for example, Customer preferences, brand loyalty, etc.).

(3) Social System

For the problem classes from 3 onwards, the "social system" with which the consultants must communicate and interact may consist of many hundreds of people, possibly widely dispersed both in location and in position within the company hierarchy. This contrasts with the situation in the earlier classes where the "social system" consists of only a few people whose roles and relationships are well understood by the consultants.

During the initial period of consultation in problem classes 4, 5 and 6, Dr. Andersen, in retrospect, would consider his group a "failure" - in the sense mentioned earlier. Initial "common sense" attention to the three issues listed above resulted in "intermittent success". At the present, with professional competence being brought to bear on both the analytical and behavioural aspects of decision making technology, a pattern of "successful consultation" is beginning to emerge.

Dr. Andersen presented three case studies to illustrate the evolution of these ideas.

Failure

The first case history, an example of failure, involves a problem in the field of venture analysis.

Five to ten million dollars had been spent on research into a new product and the company was about one year away from deciding whether or not to proceed to the level of test marketing (which would necessitate a very large capital expenditure). The department concerned was one of the largest in the company with a whole string of managers involved in the product and any decision concerning it.

The consultants' task was to assist the planning staff of the client department prepare a venture analysis to assess the product's viability in the market place as a commercial venture.

In the design of the modeling system to be used, the consultant group consciously attempted to involve all the departments concerned by asking for representatives from these to sit in their meetings. After about one year of effort and the expenditure of some $150,000 of staff time, the planning staff advised, on the basis of results extracted from the model, that the product was viable and should be commercialized. However, the Marketing Director, who had final responsibility for making the marketing assessments, rejected this advice saying that the kind of evidence they presented was irrelevant.

The group realised that they had never considered what constituted valid evidence of the product's marketability in this man's opinion. The lesson learnt was that the man who was to make these assessments should have been closely and personally involved in the consultants' work and not merely represented by a member of his staff in whom he possibly had little confidence. Evidently, the people on whose opinion the senior management relied when faced with a difficult decision were not necessarily the people nominally responsible for the formal planning activity. This former group were the people with whom the consultants should have worked. Discovering who they are involves making explicit the nature of the influence network in the organization which is normally informal and hidden. Disclosing this influence network explicitly is usually seen as quite risky by the organization and avoided in the normal course of events.

Intermittent and Inadvertent Success

As they began to gain experience in problems from the latter classes, the group was able to record some successes, but without knowing exactly why they were successful on these occasions. The second case study comes from this period of inadvertent success

The context of the case was that a manufacturing company had developed a new product but lacked the expertise to market it and, therefore, proposed to form a partnership with a smaller retail firm who had the necessary marketing expertise.

As the cost of constructing a commercial-scale plant was very great, it was clear that explicitness was required in assessing the opportunities and risks involved in the venture. The consultants were called in to help resolve differences on such issues as the prospective market share and production and marketing costs. They had to operate under a 100-day constraint (before the partnership contracts were officially signed or the agreement broken off).

At the first meeting of about 24 people from the research, marketing, production and finance departments, it was clear that, although each person was able to report on his own area, collectively they lacked direction in integrating these judgments to see their joint implications and collective uncertainties. Everyone considered that he was competent to express an opinion on the broad issues in his own as well as other departments. There was no agreed mechanism for resolving the ensuing differences. To overcome this difficulty, it was agreed that the overall problem should be broken down into a number of smaller specific issues such that agreement was obtained on who was competent to take an authoritative position on that issue. It was then necessary to define the logical relationships between these sub-problems in a computer simulation.

As an example of the kind of considerations involved in constructing the model, we may consider the Consumer Marketing Model shown in Figure 1. Of the three inputs, "Advertising Effectiveness" is a subjective parameter, but some data was obtained from market survey companies. The size of retailers stocking the company's products is, in contrast, "hard data"; in this case, it was obtained from the Nielson market research organization. "Retailers Stocking Policy" is an even more subjective matter, but the effects of different assumptions can be tested on the model. Figure 2 shows a typical subjective assessment; assuming that the retailer's decision to stock the product depends only on his expected annual sales, it gives the probability that he will adopt different threshold levels. Figure 3 shows how the "Conditional Market Share", obtained from the data about advertising effectiveness, is combined with the other two inputs to generate the retailers stocking decision.

Three main factors determine the appropriate level of disaggregation for constructing the venture simulation, viz. the time available, the numerical importance of the block and the political importance of enabling those responsible to attain an understanding of what is being done.

Once probability distributions had been defined for each uncertain parameter, the financial risks of proceeding with commercialization of the venture was determined from the computer model. The advertising issue is illustrated in Figure 4 where the dotted line represents the locus of the competitors' optimal response to each of the company's possible advertising strategies. The maximum venture worth of $ 7m is significantly smaller than the value of $25m which would be attained if the competitor failed to respond competitively to the introduction of this new product.

The final outcome in this case was that the two firms decided not to proceed with the partnership.

This was the best success during this intermittent period because of the reliance of senior management on the results of the model and their willingness to discuss problems in terms of concepts that existed in it. Analysis of what had been done showed that decisions had been taken affecting four distinct things. These were:

(1) The Data - what is valid data for any block in the model and how uncertain it is.

(2) The Logic - how do uncertainties and decisions in one part of the venture interact with others to delineate the risks involved.

(3) The Organization - who is formally responsible for assessment of each of the uncertain parameters in the prospective venture.

(4) The Relationships - the process of disaggregation reveals the informal effective hierarchy in the company.

It was now clear that any management decision would affect, and would be affected by, these four elements which were revealed as the four main regions in which a manager operates.

Success

Success in this context means being aware of obstacles and having an embryonic technology for dealing with some of them. The third case study provides an example of this.

On this occasion, the consulting group was approached by a former client, the control manager of a large department in the company. This department was responsible for manufacturing and marketing a range of products with a changing product and manufacturing technology. The Control Manager was responsible for advising General Management on long range planning for the department and reported to an Assistant General Manager who was himself answerable to a General Manager.

During the previous twelve months, the department had experienced a dramatic reduction in earnings and pressure on market share due to market place changes. The question posed was, "What pricing policy should we adopt to regain our previous profit position?"

Three years earlier, a simulation model of the department's operations had been constructed, but the predictions of this model had been ignored by the management in selecting departmental strategy. Many people thought this had contributed to the current business crises of the department. The Control Manager asked the consultants to help construct a better model. Dr. Andersen explained that this, by itself, might not be helpful. Since there seemed to be some dissatisfaction about the way management decisions had been made in the past, he suggested that they should begin by discussing the four regions of the management process with a cross-section of people in the department.

This idea required the approval of the Assistant General Manager since the subjects to be discussed fell within his domain of authority. He agreed to the suggestion and was asked to list the names of people whose expertise and/or authority were critical in the conduct of the business. These were first interviewed individually, but on the basis

that everything they said would later be shared with the other interviewees. The key question asked was, "How do you think the decision about pricing can be made more effectively?"

From these discussions, it became evident that there were many different opinions about the accuracy of the model, but everybody felt that top management took insufficient notice of their expertise. The Assistant General Manager accepted their desire to have more influence on pricing. To explore new ways of setting pricing policy, four small teams were set up, each responsible for building a model of the part of the business about which they had expert knowledge.

A new process of consultation had been introduced, in that the members of the department had been invited to accept responsibility for diagnosing and redesigning their own decision making processes.

At this stage, it became clear that the original question was an inadequate formulation of the problem. The questions which really required answers were: "What market position do we want?" and "What price are we willing to pay to achieve the desired market position?" These questions required a policy decision which could only be taken by the General Manager. After further study, they were able to place the problem before him with a comprehensive set of alternative proposals for his consideration. By the end of the year, a new business strategy for the department had been set - with some new decision making patterns established among the managers - including better computer models and greater reliance by senior managers on them.

A Model of the Management Process

Analysis of the experience gained from a number of successful cases suggests that the process by which organizations are managed can be modelled by the block diagram shown in Figure 5. Each block represents a different kind of task necessary for the successful management of an organization and these fall naturally into a hierarchy. The task represented by each of the upper blocks is

concerned with effecting change in the way that the tasks in the lower blocks are executed and may be considered as a meta-task relative to these. For successful management, feedback from the lower to the higher levels is also required.

The tasks represented by the lowest block - DECIDE/DO - are concerned with the day-to-day running of the organization. The decisions taken at this level concern objectives (for example, pricing policy) and tactics required to achieve these objectives.

The second block - MANAGEMENT PROCESS - determines how decisions are made at the DECIDE/DO level. Decisions at this level concern the four regions defined earlier, namely choosing the data, logic, organization and relationships required for the DECIDE/DO decision making process.

The third level - RENEW - represents tasks connected with improving the way the management process itself is changed. Possible methods for effecting this are:

(1) Hiring consultants.

(2) Training managers in new techniques (usually by sending them to courses off-site).

(3) Having managers diagnose and change their own management practices as they become outdated. Dr. Andersen calls this "Operating".

GOVERNANCE, the final task in the hierarchy, consists in consciously creating a system of goals and guidelines which define a purposeful corporate culture which is responsive to its survival in a changing environment. Three components of this task are:

(1) Values - locating of responsibility for and defining the process by which the organization will "learn".

(2) Norms - rules governing the internal life of the organization and affecting such things as motivation, authority, rewards.

(3) Goals - the posture the organization assumes for the welfare of its external constituency.

With reference to this model, Dr. Andersen proposed the following theorems:

Theorem 1 (If in trouble - go Meta and Proto)

If I experience recurring difficulty in making or implementing a certain class of decisions, I should look to the meta task above and the proto task below to place my recurring difficulty in perspective - to find new solutions.

For example, if I find continuing difficulty in designing, installing and getting management use of a new computerized marketing information system, I should look meta and proto. Proto - suggests I reinspect the stream of specific decisions with which the managers are grappling week-to-week for which the MIS was presumably designed. I need to get in touch with their "live" decision making processes and difficulties to have a context in which to look at my efforts to revise, install and implement a change in how they operate. Meta - suggest I reinspect the process by which I and the operating managers "Learn" what innovations in MIS and other components of the decision making process are perceived to be needed. Have they, with me, been involved in the diagnosis of their own decision making process - and been heard - and committed to the changes being made for "their good"?

Theorem 2 (Homeostasis)

If we change one component of a particular Meta task, the equilibrium of the system will be upset. Either appropriate changes will be made in other components to re-establish equilibrium, or the single component changed will ultimately be rejected and will return to its original state.

If I insert a new linear programming system to inform managers about the "situational" marginal costs (that is, shadow prices) for each element of product mix - but do not change the authority structure for deciding prices, product mix scheduled - and do not change the bonus scheme for the plant manager and sales manager - and do not change the structure of meetings to respond creatively to the new decision insight produced by the L.P. program - that program will be a "foreign body" in the management process and eventually fall into disuse and finally be taken off the computer.

Theorem 3 (Don't Skip A Meta Task Level)

If decisions are being made in everyday operations (DECIDE/DO level) whose implicit goals are in conflict with some of the people in the organization (or society), a confrontation which articulates their explicit goals (GOVERN level) and clarifies the discrepancy between these explicit goals and the operant implicit goals of the organization will not result in change. Change in the system can only occur with attention to all four meta task levels - the process of MANAGING and RENEWAL are needed to bring a new congruence between GOVERNING value, norm and goals and DECIDE/DO daily activities.

I think that the so-called generation gap is one of the more obvious examples of the application of this theorem. Students object to decisions made in the areas of pollution, transportation system, corporate profits, educational priorities, etc. They express goals and values in conflict with these decisions. However, in very few cases do they involve themselves in studying and influencing the management processes by which these decisions are made or, even more importantly, the RENEWING or learning process by which these new management processes can be introduced. Only a small fraction of the critical changes can be effected by the adversary and pressure tactics which Ralph Nader has so effectively impinged on car safety in the United States.

Some Implications to Seminar Participants

As computer scientists and trainers of a new generation of computer scientists, you are experts in an increasingly powerful information processing technology which is impinging rapidly on virtually all sectors of our society. Information is power. As the technology of gathering, storing, retrieving, processing and disseminating information changes, the power of influence over individual and collective lives changes.

You may choose to leave to others the way in which the technology impinges on the management of human affairs and the attendant goals and values change. Or some of you may choose to participate in, or prepare your students to have a role in, a more self-conscious process of harnessing this technology toward humanistic ends. If you choose the latter course, you have much homework to do tomorrow, not next week, to broaden your perspective of how the introduction of hardware and software may better allocate influence to those members of our society with legitimate power, appropriate knowledge and humanistic values.

I am challenging this group and its sponsors to review their mutual responsibility to embed the computer technology in an explicit framework and technology of governing our society. I would ask you to place responsibility for this effort with your elected leadership - and to individually and collectively review your progress at least annually at your conference.

Reference:

S.L. Andersen. GOVERNING ORGANIZATIONAL RENEWAL. To be published shortly, but not yet known where.

CONSUMER MARKETING MODEL FLOW SHEET

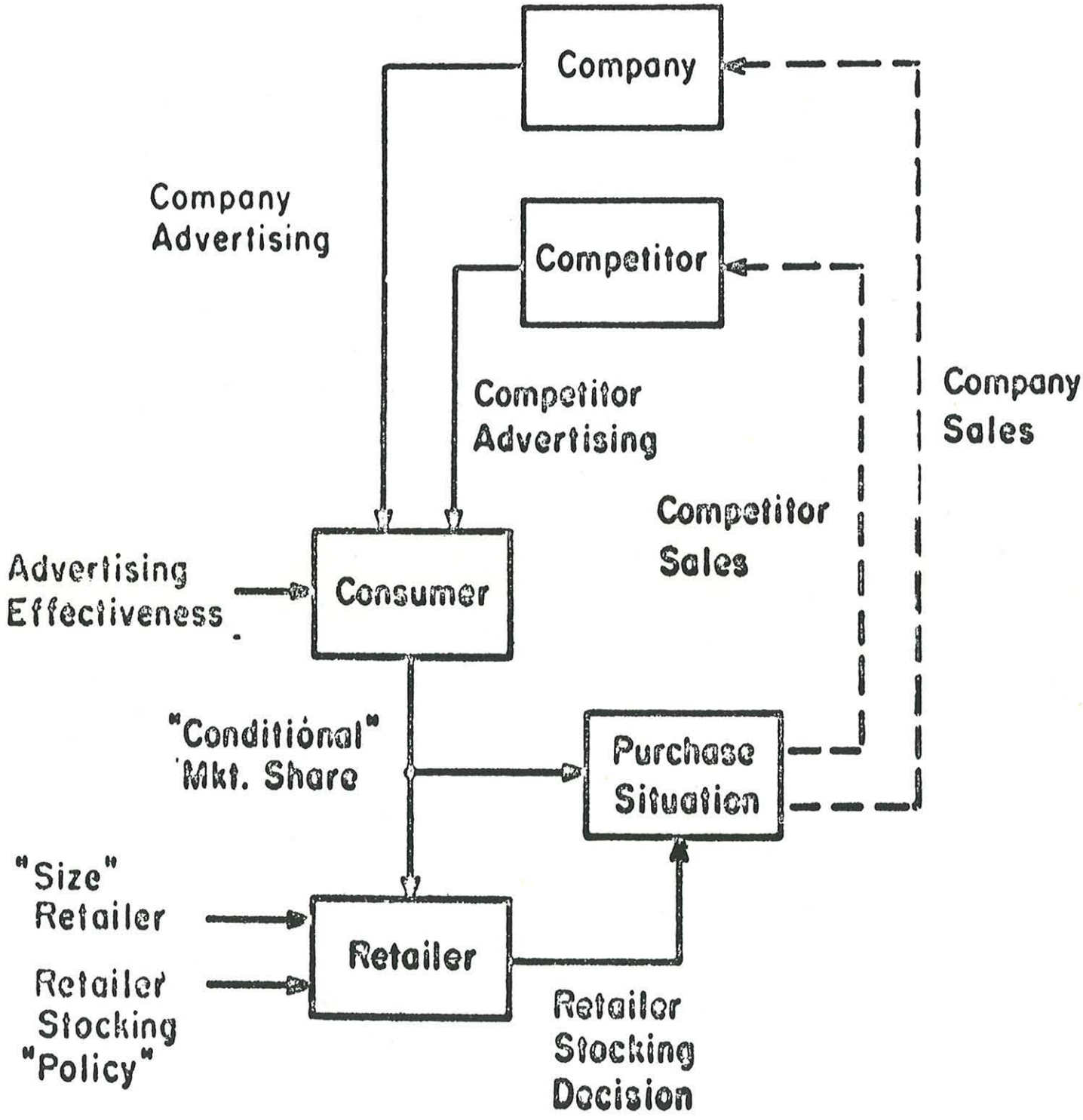
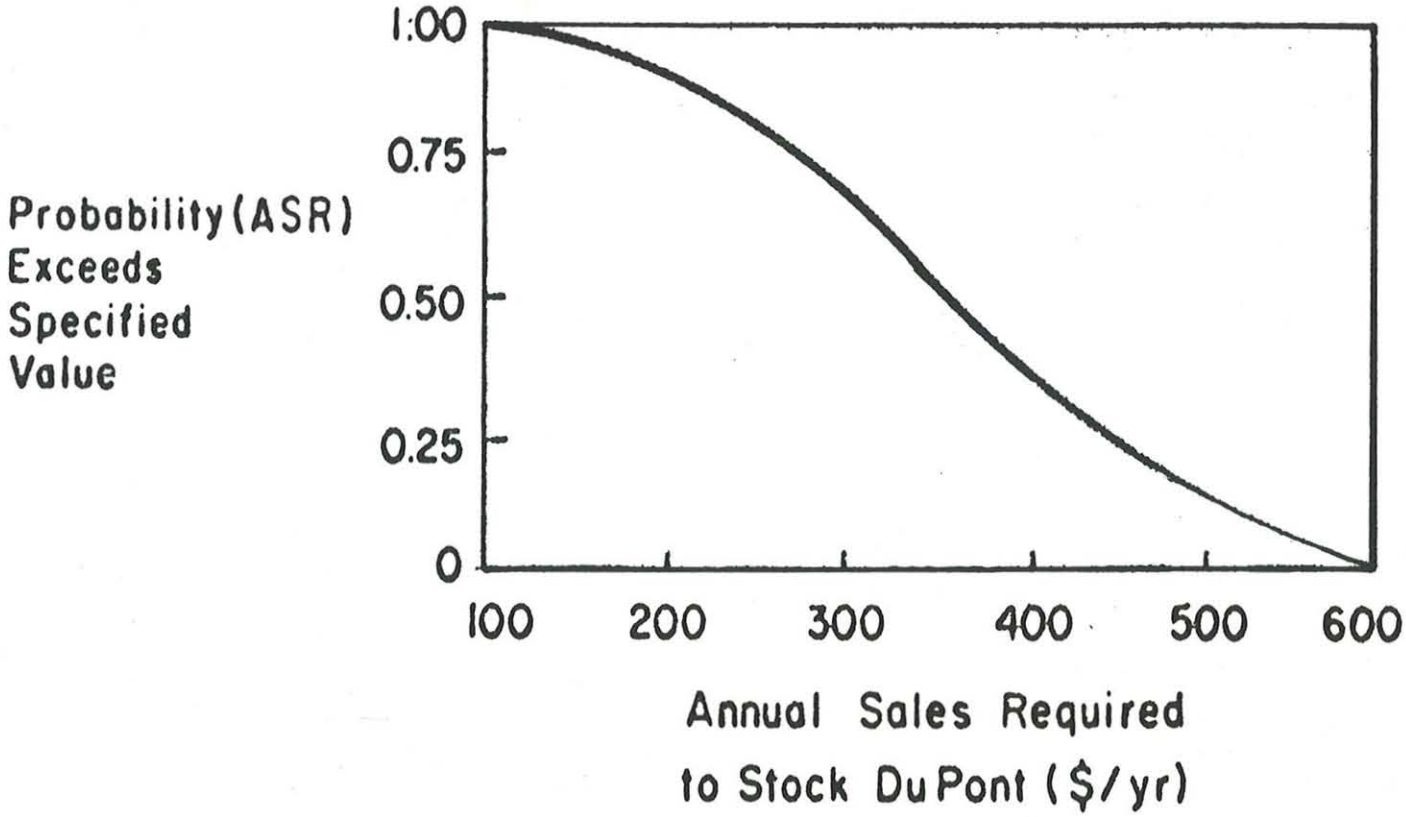


Figure 1

TYPICAL "SUBJECTIVE" PROBABILITY ASSESSMENT

Retailer "Stocking Policy"



Factors Considered in Assessment

1. Pessimistic (upper bound), $ 600/yr., Nielson Data on "second" brand minimum sales.

2. Optimistic (lower bound), $ 100/yr., subjective estimate of sales required for :
   - 5 square feet of shelf space
   - $ 90 investment in inventory

Figure 2

RETAILER LOGIC

Three Inputs

1. Size Retailer – Total annual store "product" sales
2. Conditional Mkt. Share – Company Mkt. Share in retail outlets where available
3. Stocking "Policy" – Minimum annual sales req'd to stock second brand

"Logic"

If (1) x (2) > (3)
then store will stock

Data Sources

(2) from consumer model
(3) subjective probability assessment
(1) Nielson Data

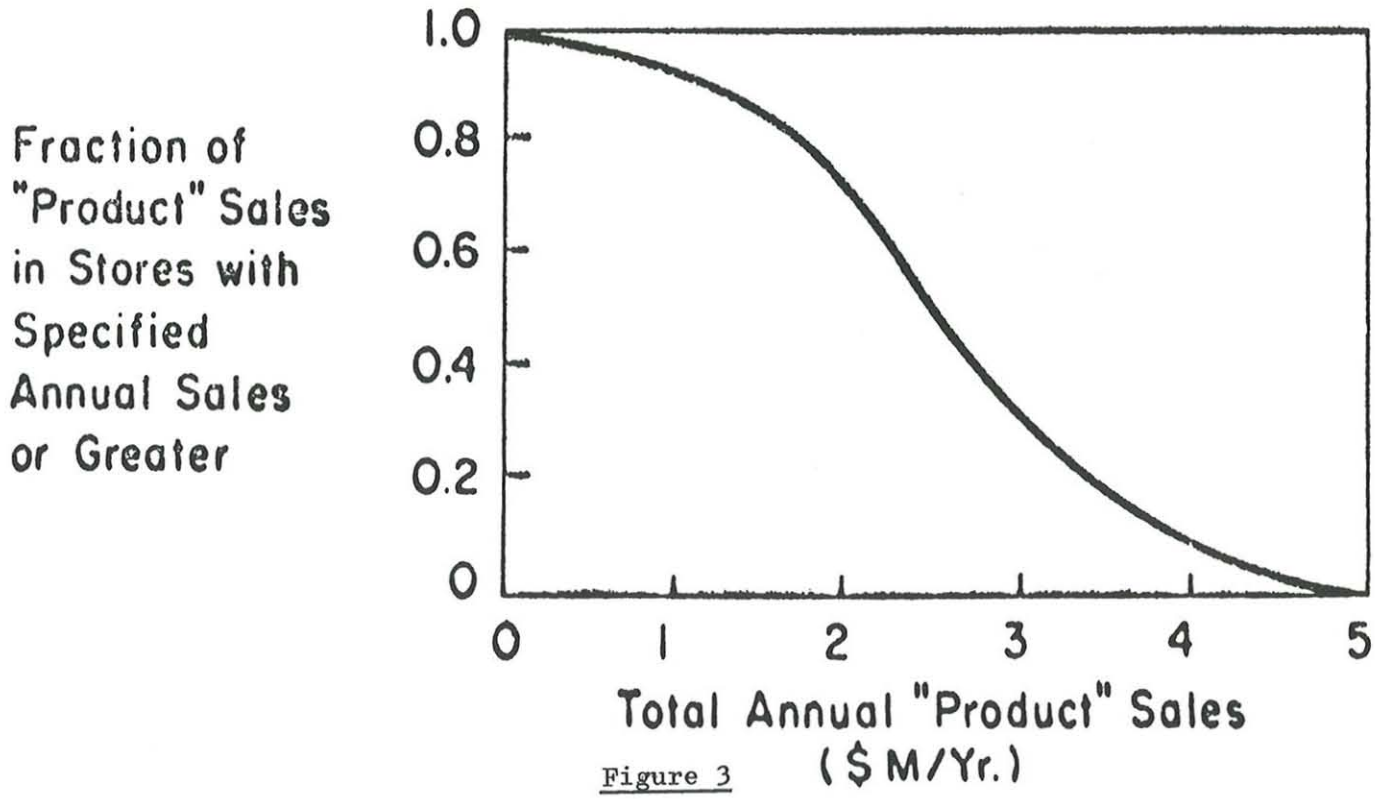
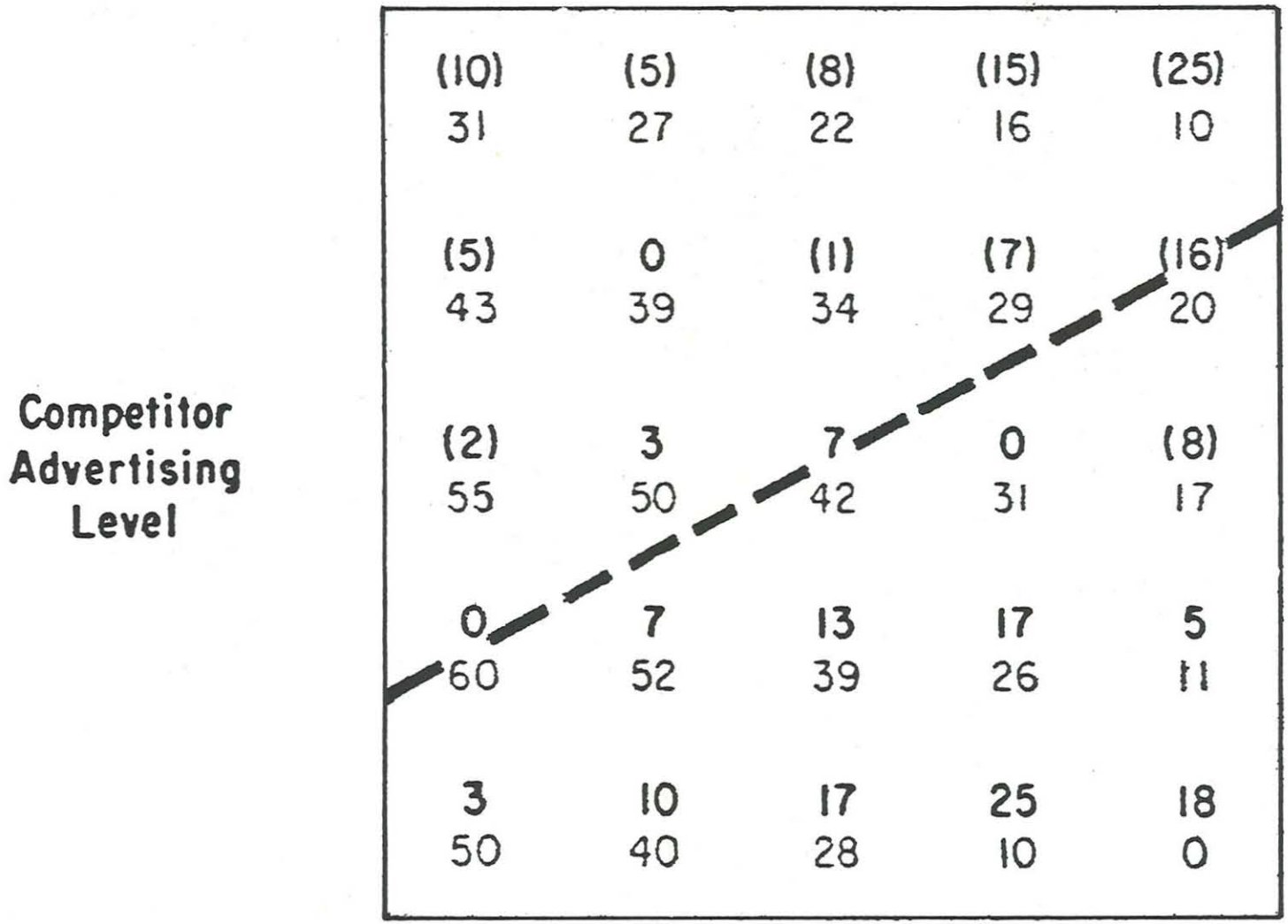


Figure 3

COMPETITIVE "GAMING" ANALYSIS



Upper numbers : Company Venture Worth.
Lower numbers : Customer Venture Worth.

Brackets denote negative quantities.

Figure 4

META-TASK MODEL

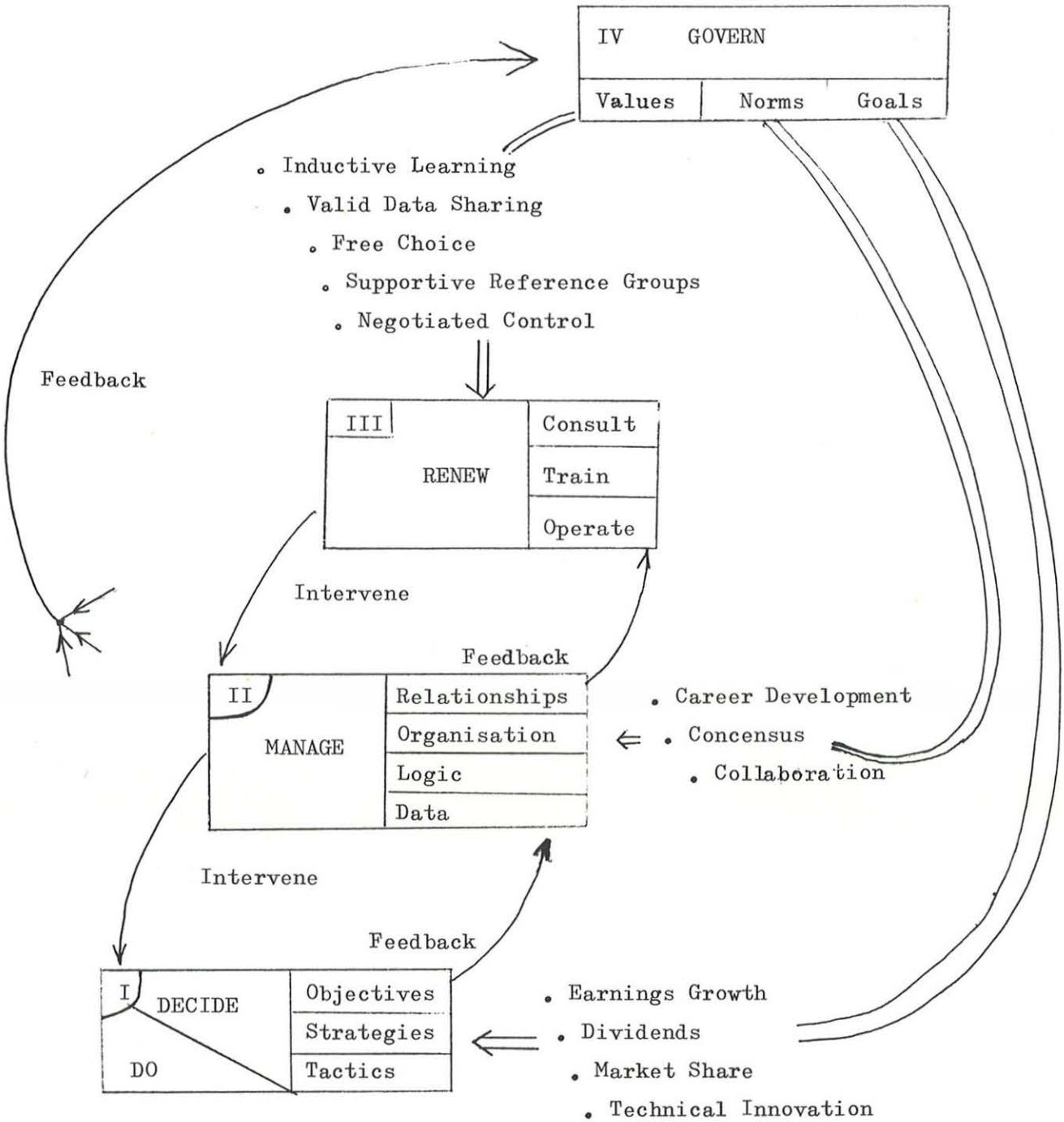


Figure 5