MARKETING PLANNING AND EXPERT SYSTEMS :

AN EPISTEMOLOGY OF PRACTICE

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Abstract

After nearly a quarter of a century, Artificial Intelligence, in spite of all its promise, has made virtually no progress in the domain of marketing, and whilst most interested parties view them as a potentially powerful way of beating the competition, there are few products and no on-line systems available.

This paper explores why progress has been so slow in the domain of marketing and describes the experience and progress of a group of major British multinational companies who have joined forces to produce an Expert Marketing Planning System, EXMAR, with the author of this paper as principal expert.

A number of conclusions are drawn, but one of the main ones is that the development of EXMAR shows that it is possible to use Expert System methodologies to build support systems in complex areas of marketing management, especially if the domain is well defined, has a large number of factors to be considered, and relevant expert knowledge is available.

Also Expert Systems are shown as being useful in helping both academics and practitioners to structure, validate and use marketing knowledge and to better understand the interrelationships between the elements of marketing. In particular, it forces managers to think deeply and in a structured way about the issues that need to be considered in developing a strategic marketing plan.

MARKETING PLANNING AND EXPERT SYSTEMS : AN EPISTEMOLOGY OF PRACTICE

Just imagine what would happen to a major industrial company's profitability if, instead of expert marketing knowledge being hoarded in the heads of an elite but small number of very experienced and successful marketing managers, all of the company's worldwide marketing decisions were being made using this expertise. Imagine what would happen to a bank's profitability if all the decisions were being made by its very best bankers. Imagine what would happen to a Unit Trust company if all the investment decisions were being made by their very best experts.

After nearly a quarter of a century of Expert Systems, dreams such as this now seem possible. But there is still a long way to go, and many formidable technical and methodological obstacles still remain to be overcome. A surprising fact about Expert Systems is that although they have inspired a number of new programming languages and powerful new computer architectures, they have made virtually no progress in the domain of marketing, and whilst most interested parties view them as a potentially powerful way of beating the competition, there are few products and no on-line systems available [1] [2]. Because Artificial Intelligence has become the latest buzzword, many software houses are hyping up their old software in advertisements, but most of these can be discounted as irrelevant in the real world of Expert Systems[3].

The principal reasons for this lack of progress centre around the technical problems associated with getting computers to mimic experts and the costs involved.

There are no shortcuts to building good expert systems. It takes a considerable amount of skill, patience and several years of effort to develop an expert system in a new area and get it into the field [4].

The purpose of this paper is:

1.   To explore why progress has been so slow in the domain of marketing and to evaluate the impact that Expert Systems are likely to have on marketing management. Consequently, technical issues are discussed only briefly. For a full technical explanation of Artificial Intelligence and Expert Systems, readers should refer to the Marketing Science Institute paper on Expert Systems in Marketing[4].

2.   To discuss the experience and progress of a group of major companies who have joined forces to produce an Expert Marketing Planning System, EXMAR, with the author as the principal expert.

WHAT ARE EXPERT SYSTEMS ?

Expert Systems is a branch of what is known as Artificial Intelligence, which is a loosely grouped activity in which a number of researchers of varying backgrounds have done some research since the mid 1950s. But Artificial Intelligence is still not tightly defined. According to Horwitt [5] "Artificial Intelligence is one of the most misunderstood concepts of our time, and little wonder. The fact that very few real-world AI applications exist only serves to feed our wildest sci-fi fantasies. One of AI's major effects, however, has been the spawning of four critical areas of business computer applications research : Natural Languages; Robotics; Visualisation Systems; and Expert Systems."

Conventional computing deals with simple and unambiguous facts with existing packages being little more than moronic number crunchers. Most software is written in the form of an algorithm, which is a list of commands for the computer to carry out in the order prescribed. It uses data held in a separate file, which is stored in a particular way. Thus, software is data plus algorithm and is useful for boring, repetitive, numerical tasks. The largest selling software has been spreadsheets and word processing packages. Database management was developed from this.

However, managers handle more than words and numbers. They are concerned about knowledge, which is information interpreted for a particular application.

The British Computer Society definition of an Expert System is:

"The embodiment within a computer of a knowledge based component, from an expert skill, in such a form that the system can offer intelligent advice or take an intelligent decision about a processing function. A desirable additional characteristic, which many would consider fundamental, is the capability of the system, on demand, to justify its own line of reasoning in a manner directly attributable to the enquirer. The style adopted to attain these characteristics is rule-based programming."

Put more simply, Expert Systems capture not only the knowledge of a human expert, but also the rules he uses to reach his conclusions. This knowledge is then made available to others by means of a computer program.

The two main components of an Expert System are:

■   the knowledge Base

■   the Inference Engine

The rules used by an expert and his knowledge and experience about a certain domain are interrogated and the captured knowledge becomes the Knowledge Base, which is the heart of the system.

The Inference Engine accesses the Knowledge Base, makes the necessary connections, draws conclusions, and generates the answers. The general reasoning strategies are separated from the Knowledge Base so as to allow the system to use knowledge in a variety of ways, requesting additional information if required to solve a particular problem and explaining the reasoning behind its questions and recommendations by reporting the rules and facts used. Since the Knowledge Base and Inference Engine are separate, an Inference Engine can be bought to be used in association with other data bases. This is called a shell.

An Expert System will usually have the following characteristics:

- it will relate to one area of expertise or knowledge rather than to a set of data

- it will be restricted to a particular topic

- it will have collected the rules (heuristics) and knowledge of an expert

- it will have an Inference Engine

- it will be capable of extension

- it will be able to cope with uncertainty

- it will give advice

■   it will explain its reasoning.

To summarise, the differences between traditional packages and Expert Systems are as follows [6]:

Traditional Packages	Expert Systems
handles data	handles knowledge
uses algorithms	uses heuristics
goes through repetitive processes	goes through inferential processes
based on large data bases	based on knowledge bases

WHY HAS PROGRESS BEEN SO SLOW IN THE DOMAIN OF MARKETING ?

During the 1960s, attention was focussed on specific problem-solving applications in scientific fields. Many successful Expert Systems have been built, including MYCIN for diagnosing infectious diseases[7], and PROSPECTOR, a system for evaluating geographical locations for possible mineral deposits [8].

Management problems, however, do not lend themselves to quite the same precise logic as scientific problems. People do not solve most of life's problems by mathematical means, but rather by experience, knowledge and intuition. Marketing problems are dealt with in the same way, as most of them are logical rather than mathematical, and problem-solving knowledge, whilst available, is incomplete.

Decision-Support Systems and the like use hard facts and static formulae which, given the correct data, provide correct answers. They belong more naturally to the logical, black-or-white, right-or-wrong world of computers. But managers in the world of marketing deal with uncertainties and often with vague concepts. Decisions invariably are built on a set of "rules", or heuristics, that reflect the expert's own knowledge and experience about the problem in question. These "rules" are hard to nail down and quantify, because the expert's experience enables him to think in terms of shades of grey, "more or less", and "approximately". Such fuzzy reasoning is commonly used by human beings to find a path through situations that are too complex and amorphous for the human mind to handle in a totally conscious, rational, scientific way.

Most people would acknowledge that in virtually any walk of life, the true expert has built up his expertise largely from experience and an intuitive grasp of problem-solving in the real world, something which is often referred to as the "University of Life". Indeed, many of the world's leading business people acknowledge that they owe their success not to formal business education and text books, but to their own experience, flair and intuitive good judgement.

Donald Schon[9] describes this phenomenon as follows: "Competent practitioners usually know more than they can say. They exhibit a kind of knowing-in-practice, most of which is tacit". He cites an investment banker, who makes his decisions based on 70 to 80 per cent instinct, and only 20 to 30 per cent calculable rules. This "gut feel" was a major asset to the bank in question. His point is that artistry is not reducible to discernible routines.

He describes scientific rigour as "describable, testable, replicable techniques derived from scientific research, based on knowledge that is testable, consensual, cumulative and convergent", but then goes on to argue that much of what passes for scientific

management is irrelevant because business problems do not come well formed. Certainly, most marketing problems are messy and indeterminate and successful practitioners make judgements using criteria and rules which are difficult to define. Many academics would decry this as a lack of rigour, and in so doing exclude as non-rigorous much of what successful practitioners actually do.

The following quotation from Schon neatly sums up the problems facing not only teachers and researchers of marketing, but, more importantly, the initiators of expert marketing systems :

"In the varied topography of professional practice, there is a high, hard ground which overlooks a swamp. On the high ground, manageable problems lend themselves to solution through the use of research-based theory and technique. In the swampy lowlands, problems are messy and confused and incapable of technical solution. The irony of the situation is that the problems of the high ground tend to be relatively unimportant to society at large, however great their technical interest may be, while in the swamp lie the problems of greatest human concern."

The problem to be addressed by Expert Systems in the marketing domain, then, centres around how to take account of the intuitive artistry displayed by experts in situations of complexity and uncertainty in a way that is describable and susceptible to a kind of rigour that falls outside the boundaries of technical rationality.

The question, then, is how an epistemology of practice can be captured and represented in an Expert System.

For an Expert System to mimic an Expert, it needs to be able to deal with the uncertainties, complexities, and vague concepts that human beings deal with routinely, even though such "rules" are neither simple nor straightforward. For

example, a simple rule for a marketing manager might be: "If the market is growing, increase promotional expenditure". This would appear to be easy for a human being to understand, but in reality words like "market", "growing", "increase" and "promotional expenditure" are open to many different interpretations, as indeed is the whole lexicon of marketing.

One way of dealing with this problem is the development of fuzzy sets. A "growing market", for example, is a fuzzy set in the sense that its meaning can vary from situation to situation. Fuzzy numbers approximate the response figures from marketing experts and these numbers are then loaded into, for example, sales projections and promotion analyses.

The foundation of any Expert System is the Knowledge Base, which can be extracted from one or more experts in a particular field. The expertise is usually stored in the form of rules of thumb (heuristics), which are, typically "If then" statements. For example, if A is true, then B is true; or if X is true, do Y. Given an initial set of circumstances, the system can map out a set of contingencies and further contingencies.

A heuristic differs from an algorithm in that it does not give a correct answer, nor does it guarantee results. It merely suggests a general direction that is more or less likely to prove more useful than another direction. An example of a heuristic in chess might be: "If a player stays in control of the centre of the board, he is more likely to win". In marketing, a heuristic might be: "if the market is growing and if you have appropriate business strengths, then an appropriate marketing objective would be to grow market share".

A system of interlinking heuristics in the form of a decision tree is one way of representing knowledge. These are sometimes "backwards inferencing" and sometimes

"forward inferencing". Backwards inferencing starts with an objective and tries different combinations of rules and/or actions until it is reached. Forward inferencing reasons from initial information until it reaches useful conclusions.

This can give rise to what is termed "combinatorial explosion", which can be avoided by pruning and the use of heuristics which are correct most of the time. This gives probable solutions to less rigorously defined problems that are too complex to be dealt with algorithmically.

To date, however, no one has seriously tackled the world of marketing with Expert Systems other than the MSI ADCAD[4] system developed to advise on advertising design. After considering a variety of consumer and environmental factors, advertisers use a combination of empirical research, communication theory, and rules of thumb, to select communication objectives and select appropriate creative approaches.

The authors themselves list a number of weaknesses in ADCAD, but conclude: "As one advertising executive put it: *"it helps us to think a little deeper about the issues we have to consider in developing ads that are both strategically and executionally sound"*. Another interesting and relevant conclusion was that most managers, when asked, said they would like to make use of existing theoretical and empirical knowledge of marketing when making decisions. However, few actually did use such knowledge. Expert Systems can bridge this gap by structuring, validating and disseminating marketing knowledge, whilst at a theoretical level, they challenge their creators to understand and critically evaluate the elements of marketing knowledge and their interrelationships.

A CASE HISTORY OF THE DEVELOPMENT OF AN EXPERT SYSTEM IN MARKETING PLANNING

During the 1980s, Japanese activity in the field of Expert Systems prompted the EEC to give birth to the ESPRIT programme in an attempt to integrate European efforts. This in turn led to the DTI sponsored ALVI programmes.

An outcrop of these is a new DTI-sponsored club by the name of EXMAR, which set out in 1987 to produce an Expert System in the domain of marketing planning, inviting the author of this paper to be the principal expert. The ten founder member companies include some of Britain's biggest and most successful multinational corporations spanning capital goods, industrial goods, consumer goods, and service industries.

After almost two years of work and an expenditure of over £$\frac{1}{2}$ million, all there is to show is a demonstrator model on a Xerox 1186 workstation which exemplifies the scope of the Expert System using a case study specially written for the club by the author of this paper.

The purpose of this part of this paper is the explain how EXMAR has developed, what obstacles were encountered along the way, how these were overcome, and what problems still remain to be solved before a commercially usable PC based system can be made available.

The first point to be made is that Expert Systems do play a vital role in the accumulation, synthesis and understanding of the constructs of marketing and their interrelationships. Many of the theories, illuminative sights, empirical research findings, models, and experience, are scattered around in books, libraries and inside the heads of both practitioners and academics. They remain, therefore, largely unavailable to most marketing managers, and indeed to most marketing academics.

The synthesis of such knowledge in a particular domain into Expert Systems not only benefits those whose task it is to develop the system, by forcing them to turn their knowledge and expertise into actionable marketing propositions, but also those responsible for marketing decisions by making it available where it is likely to have the greatest impact.

PROBLEMS SUITABLE FOR EXPERT SYSTEMS

In deciding whether marketing planning was a sensible domain for the application of Expert Systems methodology, the MSI checklist[4] proves useful. Four criteria are provided:

- Are the key relationships in the domain logical rather than arithmetical ?

    - Since the decision area is knowledge-intensive, the answer here is "yes".

- Is the problem domain semi structured rather than structured or unstructured?

    - Well-structured problems can use more conventional procedures, but since the marketing planning process is only semi-structured, the answer is "yes".

- Is knowledge in the domain incomplete ?

    - Since marketing planning and all its contextual problems remains one of the most under-researched areas of marketing, and since little has been published about the interrelationships of all the techniques of marketing in systems design, the answer is "yes". This is in fact the key to the whole project and why it was chosen in the first place by the club members.

■   Will problem solving in the domain require a direct interface between the manager and the computer system ?

    –   The intention is to have operational marketing managers using the system for the production of marketing plans, so the answer is "yes".

Marketing Planning remains one of the last bastions of ignorance in the field of marketing. The benefits of marketing planning are well documented and agreed,[10] yet so complicated is the process of marketing planning, and so confusing are the interrelationships between the tools and techniques of marketing planning[11], that very few British companies enjoy these benefits, as has been shown by a seminal paper by Greenley[12] that reviewed all the major UK empirical research in this area. Indeed, there were as many dysfunctional results from the attempts of companies to initiate marketing planning procedures as there were benefits.

The whole thrust of the project, then, was to tackle this problem by means of an Expert Marketing Planning System codenamed EXMAR.

Marketing planning can be defined as a logical sequence and a series of activities leading to the setting of marketing objectives and the formulation of plans for achieving them.

The model taken to represent the marketing planning process was the author's nine stage breakdown[10], as given in Figure 1 later in this paper.

ANALYSIS PHASE

The initial requirements analysis produced a number of interesting problems for the project, which were to sow the seeds of expensive and time-consuming delay. These problems can be summarised as follows:-

(i)   it became clear that not many of the member companies were particularly au fait with the methodology of marketing planning. This led to the problem of setting clear objectives for the project.

(ii)   the diversity of company industry types, ranging from capital goods to service industries, meant that no subsequent system could possibly be suitable for all circumstances.

(iii)   problems and subsequent proposed objectives ranged from "To support a formal planning framework to improve discipline during the planning process" and

"To support further understanding of the effects of currency fluctuations"

to

"To promote discipline in pricing control"

For these reasons, it was decided to focus on the process of marketing planning itself rather than on any situation-specific system.

METHODOLOGY

A firm of software consultants was appointed project manager and a knowledge based systems house was appointed principal contractor.

Considerable confusion surrounded the proposed delivery system with the result that specifications, such as model, functional requirements, system structure, information requirements, enhancements, consequences, knowledge base specification, validation procedures, and so on were never produced.

The systems house began a series of twelve half day interviews with the author of this paper in order to develop the Knowledge Base. Unfortunately, although taped and transcribed, they were largely unfocussed due to the inexperience of the interviewers and little progress was made towards formal modelling of the marketing planning process, in spite of very specific guidance given by the author to the interviewers. The problem centred around lack of proper project control by the project managers, confused expectations by members of the club based on marketing planning naivety, the inexperience of the knowledge engineers, and the passive role of the domain expert, which was necessary in view of the nature of the project. Several attempts on the author's part to guide the system were brushed aside as politically inexpedient.

The result was that the paper outlining the tasks to be performed by the computer system targeted the whole marketing planning process rather than any subset, and because of this breadth, the process to be computerised was not documented in any detail, nor backed up by any substantive models and interrelationships.

NEW KNOWLEDGE ENGINEERS APPOINTED

At this point, the problems began to assume crisis proportions, and the project manager appointed new knowledge engineers to take over the feasibility study and the delivery system.

The new contractor set about finding some common requirements among end users in order to outline the domain model, with a boundary definition showing which parts of the model would be tackled by the computer system. They set about establishing the following areas:

- scope

- constraints

- organisational impact

- maintainability

- extensibility

- technology

- time scales

- risk and cost versus quantifiable benefits

For the first time the EXMAR project was beginning to focus on building a system for appropriate problems that were valued, bounded and routine.

The following emerged as the final overview of the objectives of EXMAR as agreed by all members of the club.

WHAT WILL EXMAR DO ?

EXMAR is intended to be a Marketing Planner's Assistant. It will guide a user through the marketing planning process, offering advice at key stages, controlling data input and presenting data in various ways so as to assist in the setting of objectives and strategies.

The full Marketing Planning Process has nine stages, with various feedback loops, as shown in Figure 1.

Figure 1

THE MARKETING PLANNING PROCESS

1. Corporate Objectives

2. Marketing Audit

   3. SWOT Analysis

      4. Assumptions

         5. Marketing Objectives & Strategies

            6. Estimate Expected Results

               7. Identify Alternative Plans & Mixes

                  8. Programmes

                     9. Measurement & Review
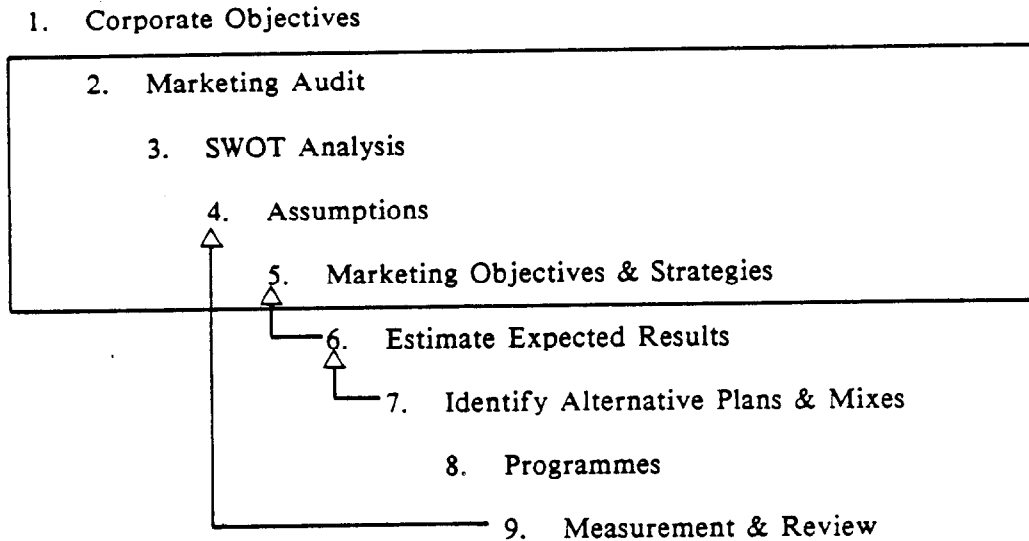
The current vision of EXMAR concentrates on stages 2, 3 and 5 because club members have consistently identified stage 5 (objectives and strategy setting), together with the preceding data collection and analysis, as the main problem areas.

Corporate Objectives and Mission Statement are taken as the given inputs (from outside the user's influence) needed to start the process. All relevant data is then collected in a Marketing Audit phase. This data is then abstracted and analysed in the SWOT phase and relevant assumptions recorded. Various methods are then available in the final phase to assist the user to set realistic and consistent objectives, together with coherent strategies to meet them.

It is anticipated that EXMAR sessions will be highly interactive and iterative, encouraging scenario planning. They should also permit analysis at different levels of detail, from a corporate overview of key business sectors to in-depth studies of individual market segments.

Further details of how members believed EXMAR would actually do this, together with implementation and development constraints, are included as Appendix 1.

From this it will be seen that members wanted IBM pc compatibility for hardware, with software amenable to change by programmers not involved in its development, and which would be amenable to extension and add-ons.

THE NEXT STEP

A number of refinements and corrections to the methodologies and interrelationships was now necessary before the project could proceed. These were detailed by the author in a separate document, the relevant part of which is reproduced in Appendix 2 to this paper.

DEVELOPMENT OF A DEMONSTRATION MODEL

Some further interviews with the knowledge engineers quickly moved the project towards the production of some deliverables. It was possible, for example, to define those parts of the marketing planning process which seemed the most likely candidates for automated support. The agreed primary objective of EXMAR was to provide automated assistance for the marketing planning process, since it had been agreed among members that in general marketing decisions are taken without

sufficient analysis and understanding of the relevant issues. The reason was seen as being a lack of knowledge and understanding of how and why the multifarious factors of marketing interact and serve to form the parameters of any business activity.

In this real life situation we see emerging the perfect role for an Expert System in marketing planning.

DEMONSTRATION MODEL

All that remained now was to produce a model to demonstrate how such an Expert System would work. For this, the author wrote a special case study based on a multinational company in the bearings industry. The case study contained all the necessary features to demonstrate the scope, methodologies and outputs of the proposed Expert System.

A detailed report was a necessary prerequisite for producing a live demonstration model. The report actually produced outlines the scope and functional breakdown, the data model, and the technique interrelationships. This report is included as Appendix 3. It is recommended that this should be carefully studied, as it describes the basic model and outlines the technique interrelationships. Not included in this paper are other parts of the report relating to technique descriptions, model testing and technical details relating to the demonstration itself.

From this it will be seen that the 9 step model shown in Figure 1 was made more amenable to computerisation, as shown in Figure 2. An example of the detail included in one of these stages is shown in Figure 3. The basic Data Model used and some of the techniques relating to it are shown in Figure 4.

Various related areas are outside EXMAR's scope, on the grounds that,
though important, they are peripheral to the central concerns of
EXMAR, and should not be studied in detail in the interests of timely
focus. These areas are summarised in the boxes on the diagram below
outside the "scoping" dotted line. Brief notes on these follow.

```
┌────────────────────────────┐        ┌──────────────┐
│  PRODUCE STRATEGIC         │        │  CORPORATE   │
│  MARKETING PLAN FOR A      │        │  OBJECTIVE   │
│  BUSINESS UNIT             │        │  SETTING     │
└────────────────────────────┘        └──────────────┘

       ── SELECT/DEFINE BUSINESS UNIT       ┌──────────────┐
                                            │  ORGANIS-    │
                                            │  ATION       │
                                            │  DIAGNOSIS   │
       ── DEFINE UNIT MISSION               └──────────────┘

                                            ┌──────────────┐
       ── FOCUS                             │  MARKET      │
                                            │  RESEARCH    │
                                            └──────────────┘
       ── CONDUCT AUDIT
                                            ┌──────────────┐
                                            │  MARKET      │
       ── SUMMARISE                         │  SEGMENTATION│
                                            └──────────────┘

       ── SET OBJECTIVES
                                            ┌──────────────┐
                                            │  PRODUCT     │
       ── SET STRATEGY                      │  POSITIONING │
                                            └──────────────┘
```

Figure 3

Conduct Audit

CONDUCT AUDIT

ASSESS STRENGTHS AND WEAKNESSES

*

CRITICAL SUCCESS FACTORS TABLE

FACTORS CHECKLIST

NEED

ASSESS OPPORTUNITIES AND THREATS

*

OT LIST

OT CHECKLIST

PORTER 5-FORCE MODEL

THREAT MATRIX

ATTRACTIVE-NESS FACTORS CHECKLIST

ASSESS MARKET ATTRACTIVENESS

*

MARKET ATTRACTIVENESS TABLE

SUPPLIER

The objective is to assess the state and prospects of the products and markets already identified. Information needed at this point may have been collected in advance of the planning process, or it may be collected now.

DATA USED BY TECHNIQUES

The diagram below shows the data used as input by some of the

techniques modelled.

LC

●Market attractiveness factors (MAFs)

MARKET OR MARKET SEGMENT

* name
● need fulfilled (defn.)
● Size
● growth info (L.C)
● C.S.F 's

INVOLVE- MENT IN MARKET

(actual or potential)

● Score on MAFs, and overall score

BUSINESS UNIT

(self or competitor)

● Definition
● Planning period
● Relation to organisation structure

DPM

BOSTON

OBJECTIVE

PRODUCT FOR MARKET

● differentiation (1-10)
● market share
● costs
● score on CSFs, + overall score
● new/existing
● price/average price
● sales volume

PORTER

ANSOFF

is sold into

PRODUCT

| BASIC PRODUCT | COMPOSITE PRODUCT | PORTFOLIO |

* name
● costs
● new/existing

(self or competitor)

Production of a Demonstration Model

At a packed meeting of the members in December 1988, the demonstrator model was unveiled. Its purpose was:

- to demonstrate how such a system would meet the club's primary objectives;

- to provide evidence of the feasibility of building such an Expert System in technical terms;

- to provide a basis for feedback about the systems's utility.

It was developed on a Xerox 1186 workstation running the Interlisp environment to minimise the time required to build the demonstrator and because of Interlisp's power and maturity.

The demonstrator provided:

- guidance and support for the marketing planning process at various stages and help in managing the interactions;

- variable forms of information presentation and manipulation, such as data forms, diagrams and text. Relationships and constraints between information are managed by the system, for example by calculation and iconic cross-references;

- a free interface which allows the user to take the initiative in determining precisely what he wants to do next, and what he wishes to have displayed to assist his actions. This is done by the provision of a number of means of navigating around the window-based system.

The demonstrator model was spectacularly successful with club members and clearly illustrated the large amount of iteration that would need to occur in generating a plan. It also gave some indication of the processes of information gathering and debate that would typically have to occur in the real world whilst using the system.

Conclusion

Although the actual demonstration model using the case study is not included in this paper, for reasons both of confidentiality and brevity, the EXMAR project has clearly reached a stage of development that demonstrates the value of Expert Systems in marketing.

A number of conclusions can be drawn:

(i)   The development of EXMAR shows that it is possible to use Expert Systems methodologies to build support systems in complex areas of marketing management, especially if the domain is well defined, has a large number of factors to be considered and relevant expert knowledge is available.

(ii)   The more complex and amorphous the expertise to be captured, the longer it takes both the expert and the knowledge engineer to reach an acceptable approximation. It is clear that to develop an Expert System that is of some practical use requires both time and resources of massive proportions. This is supported by the MSI research paper[4], which concludes: "There are no shortcuts to building a good Expert System. It takes a considerable amount of skill, patience, and years of effort to develop an Expert System in a new area and get it into the field".

(iii)   Expert Systems provide a consistency to human decision making which is valuable, since people tend to forget or ignore knowledge.

(iv)   EXMAR has generated considerable interest and support among the major multinational companies that form the club, because it forces them to think deeply and in a structured way about the issues that need to be considered in developing a strategic marketing plan.

(v)   Expert Systems are useful in helping both academics and practitioners to structure, validate, and use marketing knowledge and to better understand the interrelationships between the elements of marketing.

(vi)   Tight project control is vital. This view is supported by Mumford[13]. In particular, the following issues need to be considered:

    (i)   **Subject matter**

        - how well it is defined ?

        - is it likely to change during the project's life ?

        - can adequate inputs be provided by both experts and knowledge engineers ?

    (ii)   **The User**

        - do they understand the likely time of the project ?

        - do they know exactly what they want ?

        - are they willing to work constructively to solve problems ?

    (iii)   **Time**

        - are the project deadlines realistic and achievable ?

(iv)   **Resources**

    - is the budget sufficient ?

    - is sufficient skilled human resource available ?

    - will facilities requirements be catered for ?

(v)   **Project Management**

    - is the project management strong enough and sufficiently disciplined?

(vii)   The potential advantages of Expert Systems are:

- consistent advice

- secure knowledge bases

- making better use of experts

- enhanced decision making

- improved analysis

(viii)   The stages in building an Expert System are:

(i)   problem identification and definition

(ii)   the acquisition of relevant knowledge

(iii)   the representation of relevant knowledge

(iv)   the selection of a reasoning approach

(v)   system selection

(vi)   prototype development

(vii)   system refinement and validation.

(ix)   Since we live in an imperfect world, with imperfect problems and imperfect tools, it is unreasonable to expect a perfect Expert System until there are perfect experts and perfect technology. On the other hand, if an Expert

System gives better advice than you would have had without it, it is probably worthwhile.

In conclusion, it is unlikely that Expert Systems will ever be able to give the same value as real human experts, although clearly they can offer reasonable advice. Nor will they guarantee that you make the right decisions. But they can help you gain a proper perspective of the alternatives.

In a sense, Expert Systems will always be a bit like Distance Learning programmes, which can replace a bad teacher, but never a good one.

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HOW WILL EXMAR ACHIEVE ITS OBJECTIVES ?

Firstly the system will prompt the user for information to define the business unit to be analysed. This will include a basic definition, mission statement and top level objectives.

The user will then be asked to specify the market segments and products to be analysed (the system uses a simple Pareto 80/20 rule to help the user to focus on the most important business areas). The result is a comprehensive list of existing and potential product-in-market combinations which can be organised in the form of an Ansoff Matrix (Figure 2).

Figure 2

ANSOFF MATRIX

Increasing Technological Newness

$\longrightarrow$

PRODUCTS

		Existing	Potential
M A R K E T S	Existing	MARKET PRESENTATION	PRODUCT DEVELOPMENT
	Potential	MARKET EXTENSION	DIVERSIFI-CATION
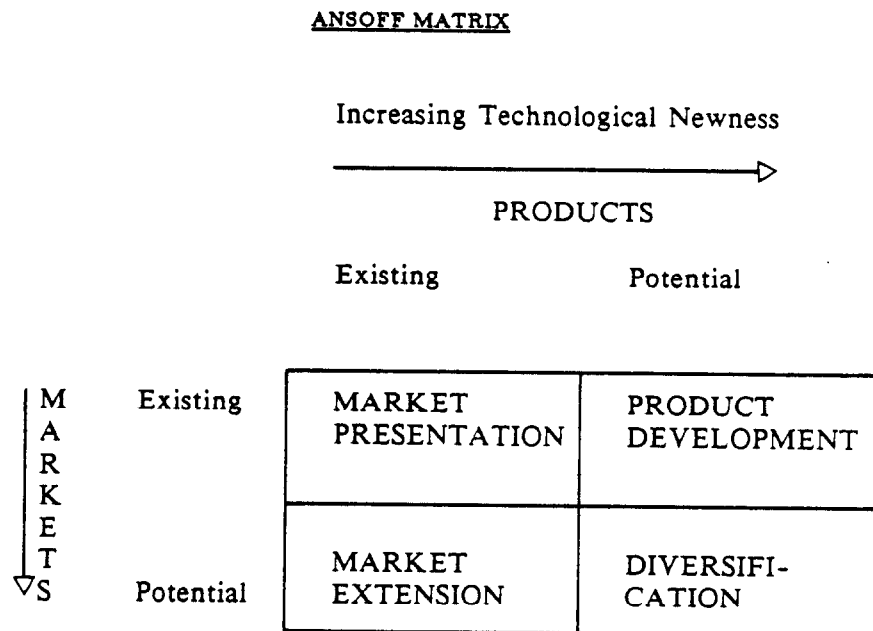
The system will ask the user to order the products and markets by how new they are to the business unit's existing area of operation.

At this (audit) stage the Ansoff Matrix is used to drive the data collection process.   It can be used in later stages to assess strategic direction by reference to the classification of product/market combinations in each box (eg. Market Extension versus Product Development).

Once a complete list of Markets and Products has been established the system will prompt for key information required for the SWOT analysis and later stages.   For each market segment the user must supply two sets of factors: one to measure the attractiveness of the market to the business unit; the other to measure how a product may be evaluated by that market. These are known as Market Attractiveness Factors and Critical Success Factors (MAFs and CSFs).

Each product must then be evaluated for each relevant market segment by inputting scores against the CSFs previously specified, to assess business strength (relative to the competition).   This has to be done for both the current position and the forecast position.   Forecasts are also required of performance level.

The SWOT stage also requires information on opportunities and threats, in terms of their impact and likelihood.   These can be summarised in an Impact/Urgency matrix and referenced at later stages, where the user is reminded of threats of high impact and likelihood when setting strategies.

A large amount of analysis is necessary to support the SWOT stage and EXMAR will be able to access other packages for supplementary analyses.

Assumptions are input as part of the forecast and once the SWOT is complete the user can proceed to set objectives and strategies.

Objective setting is driven by the concept of Gap Analysis which portrays the target level of performance and a 'status quo' forecast figure. The forecast is obtained from summarising the performance level of all Product/Markets in the top left hand corner of the Ansoff Matrix.

The user attempts to close the gap by:

a)   selecting existing product/markets and improving operational performance

b)   selecting new product/markets for inclusion in the portfolio.

The key aid for the user in this process is the Directional Policy Matrix (Fig. 3) which essentially summarises a large amount of the SWOT analysis.

Figure 3

DIRECTIONAL POLICY MATRIX

Business Strengths (CSF Scores)
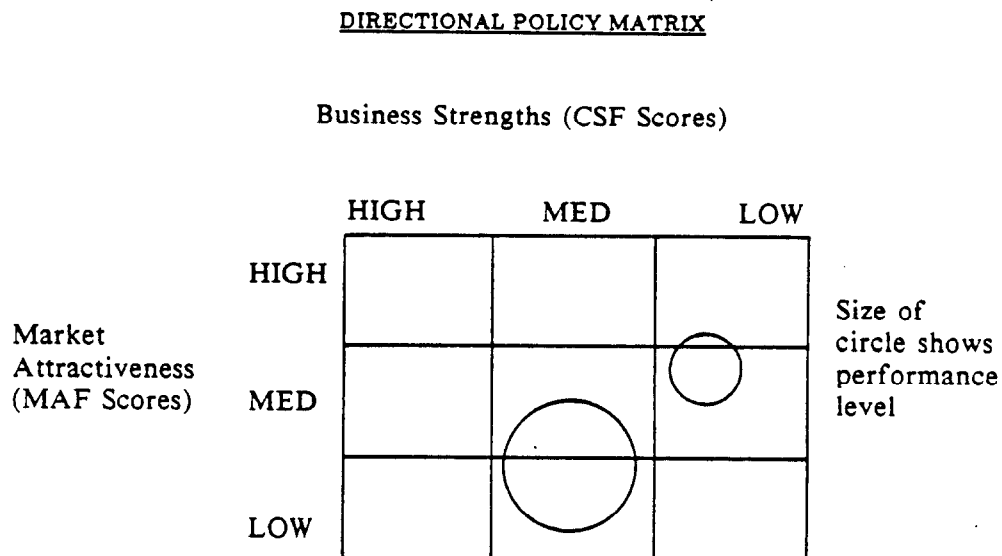
This is a very versatile tool which visually displays a large number of the measurable criteria relevant to the selection decision, including performance (size of circle) and potential for improvement (position on the matrix). The

user will be able to move circles to more favourable positions on the matrix to represent changes in objectives and such movement is recorded by the system. Later, the user will be prompted for strategies to achieve the movement.

The result of this stage will be a set of revised product-in-market objectives with associated strategies. At any point the evolving strategy can be evaluated and the system will produce reports and various displays to assist this evaluation. For example, portfolio balance can be evaluated using the Directional Policy Matrix itself, plus other tools including the Ansoff and Boston Matrices. This implies considerable feedback from strategy to objectives setting and the system will document reasons for changes.

This phase is potentially very rich in expertise, and research into ways of capturing this is continuing within the club.

WHY DO WE WANT EXMAR ?

The System will provide:-

1) an automated implementation of a rigorous marketing planning process. Historically the process has been difficult to implement rigorously.

2) a comprehensive statement of the data requirements of the marketing planning process, with particular emphasis on the quantification of previously nebulous concepts such as business strengths.

3) powerful visual displays of key information. These aid understanding and communication. They also free the user to concentrate on other expertise-rich concepts such as coherence and consistency of strategy.

4) an opportunity to build a hierarchical structure of plans, from business overview to detailed product analysis. This will depend on the quality of implementation.

The benefits of the above, in terms of the quality of plans (and of the debate during their construction) are similar to those claimed by formalised marketing planning. No existing software approaches the functionality of that envisaged by EXMAR.

IMPLEMENTATION CONSIDERATIONS

Organisation

Organisationally, EXMAR simply requires the existence of a marketing manager to use the system. Naturally such a user will need access to the required data, some of which may not be available immediately. One of the spin-off benefits of EXMAR may be to act as a catalyst to prompt change both organisationally and in the data collected.

DEVELOPMENT CONSTRAINTS

The club has consistently specified IBM PC compatibility for hardware and this has not changed. Software is a more flexible issue but the following are requirements which should be borne in mind.

a) Club members are very likely to want to develop and customise their copy of the system. This implies:-

    1) Software which is amenable to change by programmers not involved in its development.

    2) A preference for software which has a wide user base, particularly among club members.

    3) Some level of system documentation.

b) Expertise is likely to be gained in using EXMAR over time, which will generate a need to 'build-in' further levels of expertise.

    Thus the software should be amenable to extension of the expert system aspects, implying a rule-based or list processing capability.

c) The software should have adequate data communications for access to and from other packages. This requirement also indicates a likely future requirement for a multi-tasking environment.

d) Some club members have been conditioned to expect Goldworks to be the chosen software and may already have committed themselves to this package.

APPENDIX 2

Refinements and corrections to the methodologies and interrelationships outlined in a letter to the club working by Professor Malcolm McDonald

1. The Directional Policy Matrix

(i)   It's OK to have nine boxes, which is in any case the way it was originally conceived. I personally keep it to four because it is conceptually easier and fits more comfortably into what "students" have become used to via Ansoff, Boston, Porter, et al. Nonetheless, the nine box matrix does provide more options and greater flexibility.

Can I suggest that, rather than confusing users at the construction stage with a nine box matrix, we only put the lines in after the calculations have been completed. We must, then, ensure that the dividing points are 33.3 (or 3.3) along each axis.

(ii)   It is imperative that you do not try to use profit as a measure of circle diameter. Take it from me, every time this measure is used, it distorts the truth. For example, there may be a product or market that accounts for, say, 50 per cent of sales value, but 10 per cent of "profits". This would appear as a small circle, so masking its true use of resources. In any case, profit is an accounting notion which depends on an arbitrary allocation of overheads. There is also the tricky question of whether it is products or customers that determine profitability. It is usually

the latter, which is rarely catered for in accounting systems. In any case, profit is almost certain to be strongly reflected in the Marketing Attractiveness criteria.

(iii) We should make it clear that there are many different levels of analysis. This could involve any of the following:-

- Regions (of the world)

- Countries

- Areas (of countries)

- Companies

- Strategic Business Units

- Divisions

- Product Groups often synonymous with markets

- Products

- Segments

- Customers

- Distributors/Agents/Wholesalers

Etc.

Each one of these can be further sub analysed, if necessary.

(iv) We should ensure that users are made aware of the pitfalls, which are as follows:

(a) Users must beware of becoming emotionally involved in their own interpretation of "attractiveness", which often leads to them "fiddling" the system to ensure their business comes out in the upper quadrants. It is clearly illogical (or at least unusual), if everything is seen as highly attractive. In such a case, either all are equally attractive, or the scoring is wrong. The scale 0 - 10

is meant to represent relative attractiveness according to their own criteria, so that something that is near to 0 is nothing like as attractive to the company as something that comes out at, say 9.5. But is does not necessarily mean it is unattractive. To make this effective, perhaps we should put in a suggestion that users might think in terms of "potential" if they feel (after being given due "warning" of the pitfalls) that the word "attractiveness" might cause problems. One other warning. Users must be prepared to score 0, where appropriate. We might even put in a proposal that, if appropriate, the scale might have negative values to go along with a negative scoring system. This might be appropriate where there are very wide extremes.

(b)   One final point on this. Recently, I had a case of a company which was experiencing decline in all its segments. In this case, "attractiveness" hardly seemed like the appropriate description. So, instead we used "potential", since some divisions had greater potential for growing sales and profits than others. For example, the "shipping" market was in decline, and the company had a high market share. In the "food" market, on the other hand, (also in decline), the company had a much smaller market share, so the potential for taking market share (and improving profit), was greater, hence it appeared in the upper quadrant. Not surprisingly, "Food" also appeared on the right of the horizontal axis. The point is that had we not used this device, everything would have appeared in the bottom part of the matrix. Whilst this is obviously a possibility, it would not have been particularly helpful in this somewhat sad case. Whether the total picture in this case is acceptable or not is irrelevant.

The truth is that this company has diversified into other unrelated business areas that are much more attractive. Had these newer SBUs been included in the analysis, then clearly even "Food" would have appeared as low in attractiveness.

(v)   A propos the two situations (t-3 to t.0 and t.0 to t+3) for the vertical axis, I must stress my strong reservation that his will almost certainly confuse most users, and might even irritate them having to do it twice.

Nonetheless, it's perfectly logical, consistent and feasible. What we must stress, however, is that the first part of the exercise must be for t-3 to t.0 and __must__ reflect what has happened __historically__. The __next__ part of the exercise, t.0 to t+3, is a __forecast__ of attractiveness and must reflect their view of what will happen over the next three years.

2.   __Quantifying Opportunities and Threats__

First of all, let's consider the following generalised list of macro and micro factors which might be relevant:

demographic
economic
technological   } macro
political
legal
social/cultural
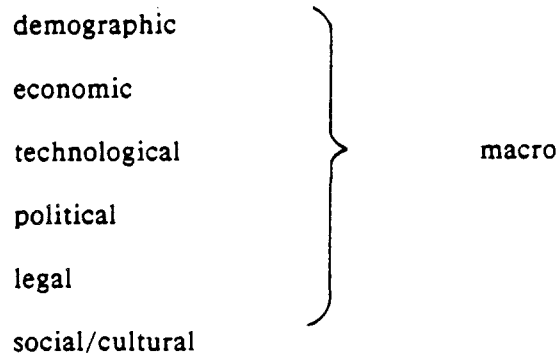
customers

competitors

distribution channels   } micro

suppliers

potential competitors

A much more detailed checklist will be provided with the actual system.

These might be considered to be either <u>opportunities</u> or <u>threats</u>. I suggest we provide a matrix (similar to the ISSUES MATRIX) for each, ie. two matrices, one an OPPORTUNITY MATRIX, the other a THREAT MATRIX.

We could make it work as follows:-

(a)   List <u>Threats</u> (no more than ten)

(b)   <u>Probability</u> of occurrence (within t.0 to t+3) (.05 to .95)

(c)   <u>Impact</u> on the organisation (score 1 to 10)

The matrix would look as follows:

IMPACT

	10	6	3	1

PROBABILITY OF OCCURRENCE

It can be seen here that Threat 1, say something specific to do with CAP (Common Agricultural Policy), will have a big impact on the organisation (score 8), and that there is a high probability that it will happen (probability .8).

All Threats can be plotted using this methodology, which would need some guidelines similar to those provided in my ISSUES PRIORITY MATRIX.

The whole process can then be repeated for Opportunities.

3.   **Strategies arising out of Directional Policy Matrix analysis**

If we get users to predict the scores of Critical Success Factors, then clearly they will need to convert these into strategies.

We must be careful not to lead them too much "by the nose", and I suggest we don't need to go beyond the overall guidelines suggested by the Shell Directional Policy Matrix. Clearly, these must be converted into 4 x Ps jargon by the user, but it would be a gigantic task to attempt to list all possible combinations of marketing mix strategies.

Also, the overall objectives for each product/market should be consistent with the guidelines suggested by the Porter Matrix and by Life Cycle Analysis.

4.   <u>Market Life Cycle</u>

We must be careful here. There is no general recognition in theory of anything called a "Market Life Cycle". I have sent under separate cover a detailed explanation of what I mean. But yes, of course the guidelines can be included to help users select appropriate strategies.

Scope, Functional Breakdown, Data Model and Technique Interrelations of Exmar

Scope and Functional Breakdown

This section defines the functions performed during the relevant stages of the Marketing Planning process, and in some cases breaks down the functions into simpler functions. The functions are related to techniques and methods used in carrying out the function, and to deliverables that form part of the Marketing Plan, as defined by McDonald. The top level breakdown is used to refine further the scope beyond the definition contained in R1 Initial Findings Report.

NOTATION OF FUNCTIONAL BREAKDOWN DIAGRAMS

The diagram below summarises the notation used in the Functional Breakdown diagrams. Function boxes represent tasks to be performed as a step towards production of a marketing plan. Technique/method boxes have icons that illustrate the style of representation used by the techniques or method.

```
                    ┌──────────────────────┐
                    │                      │
         ┌──────────│   FUNCTION           │
         │          │                      │
         │          └──────────────────────┘
         │
         │                      "may use/produce"
         │      ┌──────────┐                    ┌──────┬────────────┐
         │      │ SUB-     │                    │      │ TECHNIQUE/ │
         ├──────│ FUNCTION 1│- - - - - - - - - -│ ICON │ METHOD/    │
         │      └──────────┘                    │      │ DOCUMENT   │
         │           ▲                          └──────┴────────────┘
         │          ╱
         │         ╱ "may involve feedback to"
         │        │                                        "Deliverable"
         │         ╲                                             *
         │          ╲
         │      ┌──────────┐  "must use/produce"  ┌──────┬────────────┐
         │      │ SUB-     │                      │      │ TECHNIQUE/ │
         └──────│ FUNCTION 2│- - - - - - - - - - -│ ICON │ METHOD/    │
                └──────────┘                      │      │ DOCUMENT   │
                                                  └──────┴────────────┘
```
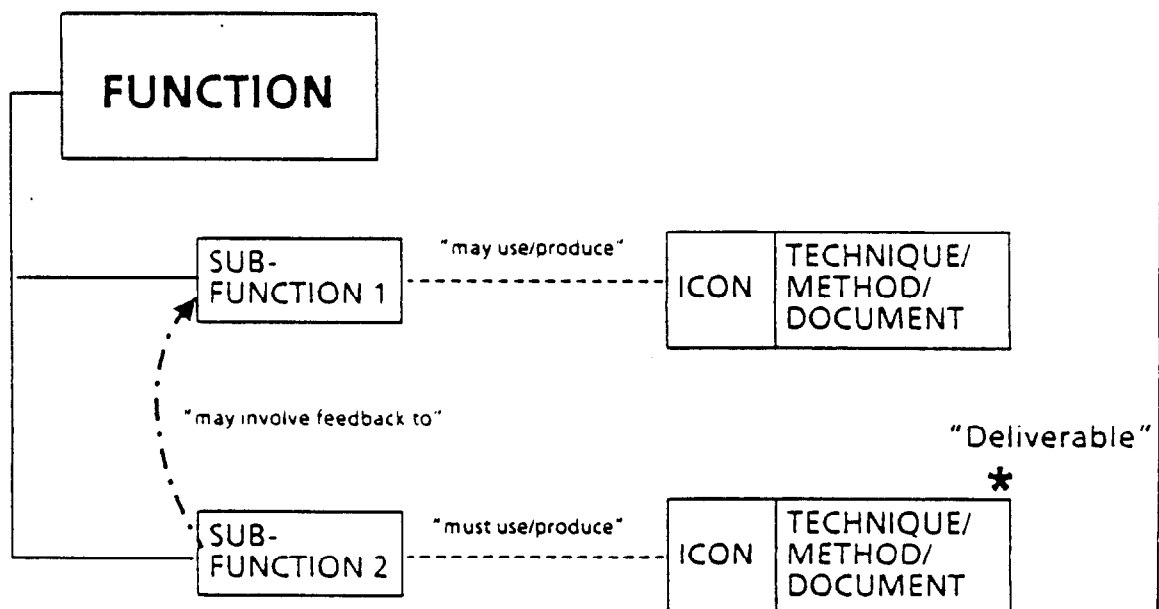
Top Level Breakdown and Scoping

SCOPING DEFINED BY INITIAL FINDINGS REPORT

The Initial Findings Report defined the scope of EXMAR Phase 2 as being the marketing audit, SWOT analysis and objectives and strategies stages of McDonald's 9 stage breakdown of the Marketing Planning process. This is taken as the starting point for this section. The diagram below summaries this.

The Marketing Planning Process

1. Corporate objectives

2. Marketing audit

3. SWOT analysis

4. Assumptions

5. Marketing objectives and strategies

6. Estimate expected results

7. Identify alternative plans and mixes

8. Programmes

9. Measurement and review

Objectives are set subject to certain assumptions: other than this, little formalism has yet emerged with regard to assumptions.

The setting of corporate objectives is outside Phase 2 scope. So any information from the corporative objectives required is regarded as an input to the model.

It is useful to produce a slightly differing top level breakdown than that contained in McDonald's 9-stage diagram. This is given below. Explanatory notes follow.

```
┌─────────────────────┐
│  PRODUCE STRATEGIC  │
│ MARKETING PLAN FOR A│
│    BUSINESS UNIT    │
└─────────────────────┘
          │
          ├──── SELECT/DEFINE BUSINESS UNIT
          │
          ├──── DEFINE UNIT MISSION
          │
          ├──── FOCUS
          │
          ├──── CONDUCT AUDIT
          │
          ├──── SUMMARISE
          │
          ├──── SET OBJECTIVES
          │
          └──── SET STRATEGY
```
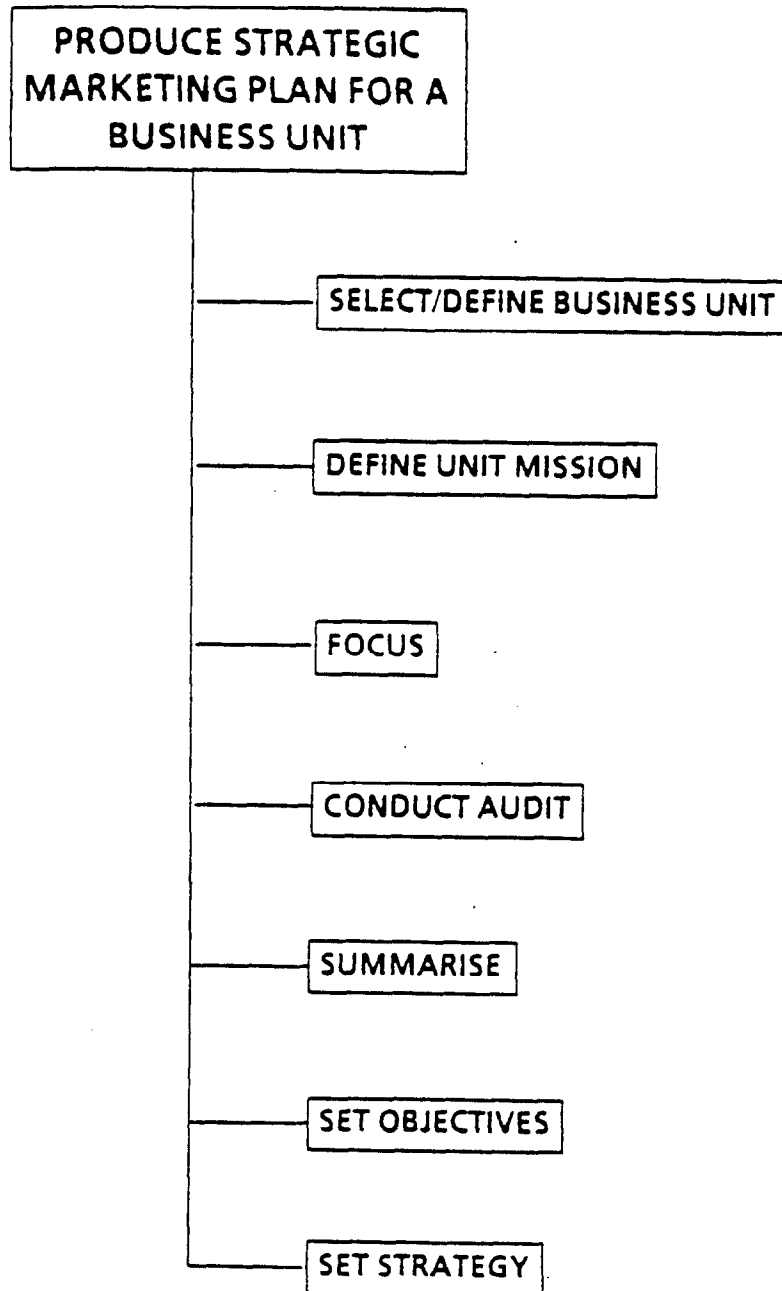
Produce Strategic Marketing Plan for a Business Unit

This describes the task being modelled. ·It is strategic because it involves ignoring some details to aid clearer thinking about the important parts of a business. It is for a business unit because this process can be carried out at any level of an organisation, or for a subset of the business that crosses organisational boundaries.

Select/Define Business Unit

Identify which area of the business the marketing plan is for.

Define Unit Mission

Define what the business unit is in existence to achieve.

Focus

Identify which of the unit's products and markets are of interest.

Conduct Audit

Assess the products and markets identified in Focus stage.

Summarise

Summarise the products in the business unit in a form suitable as a starting point for the setting of objectives.

Set Objectives

Set objectives for the business unit based on the information collected, analysed and summarised.

Set Strategy

Define strategy by which the objectives are to be met.

Various related areas are outside EXMAR's scope, on the grounds that, though important, they are peripheral to the central concerns of EXMAR, and should not be studied in detail in the interests of timely focus. These areas are summarised in the boxes on the diagram below outside the "scoping" dotted line. Brief notes on these follow.
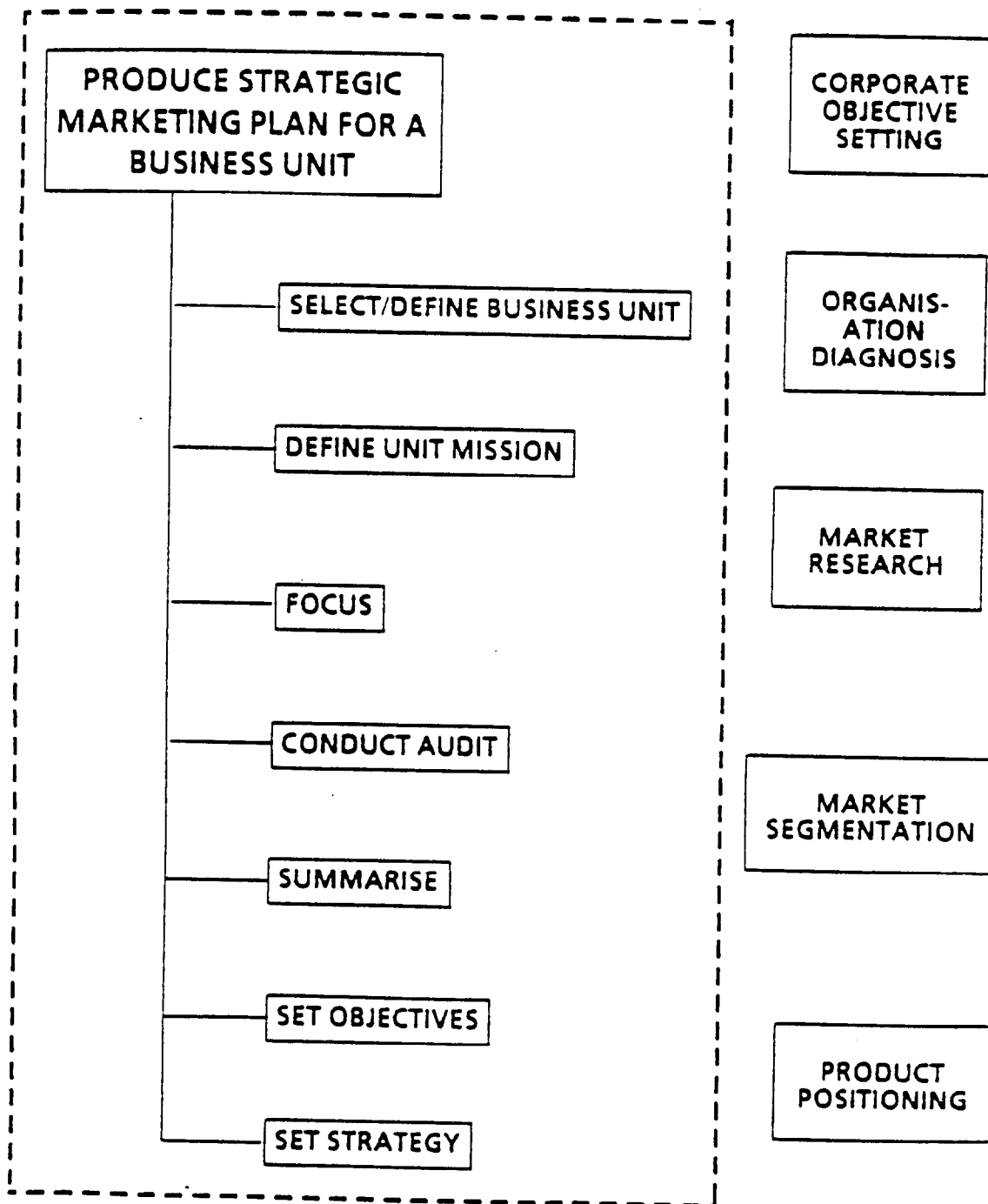
Organisation Diagnosis

Such issues as diagnosis of the health of an organisation, Blake-Mouton Matrix etc.

Corporate Objective Setting

The means by which corporate objectives are arrived at is not within EXMAR's scope. Where corporate objectives (or business unit objectives derived from them) are required by later parts of the marketing process, they are regarded as an input to the model.

Market Research, market segmentation, product positioning

Such techniques as research into the needs or wants of customers, positioning products within markets by finding criteria with which to map the market, and related market segmentation techniques are not covered. The results of market segmentation are important to the functions modelled, so this is essentially an input to the model, though some assistance may be offered.

TECHNIQUES CONSIDERED

Porter Matrix

Critical Success Factors table

Directional Policy Matrix

·Ansoff Matrix

Boston Matrix

Product Life Cycle

Gap Analysis

Objectives Typology

Threat Assessment

Market Attractiveness Table

Cost Experience Curve

Porter 5-Force Model

Downside Risk Assessment

TECHNIQUES LEFT OUT

Opportunity Matrix

Product Positioning Map

Customer Preference Map

Market Segmentation Map

Diffusion of Innovation

Blake/Mouton Matrix

Organisation Diagnosis

McDonald Productivity Matrix

Size/Diversity Graph (part of organisation diagnosis)

Market Segmentation Studies - detail to investigate

Financial Summary - both part of Marketing Audit

Response Elasticities

DEFINE UNIT MISSION

```
┌─────────────────────┐              ┌───────┬──────────────┐   *
│ SELECT AND          │──────────────│ /\/\/\│ BUSINESS     │
│ DEFINE              │              │       │ UNIT         │
│ BUSINESS UNIT       │              │ /\/\/\│ DEFINITION   │
└─────────────────────┘              └───────┴──────────────┘
```
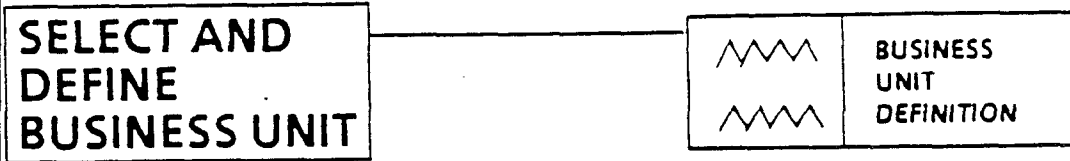
This involves definition of what the unit is for, including any
financial targets. This will be a corporate mission statement if the
whole organisation is being considered. Otherwise it will identify the
specific role of the unit within the organisation.

SELECT/DEFINE BUSINESS UNIT

```
                                  ┌───────┬──────────────┐  *
                                  │ /\/\/\│ FINANCIAL    │
                                  │       │ SUMMARY      │
┌─────────────────┐               │ /\/\/\│              │
│ DEFINE UNIT     │───────────────└───────┴──────────────┘
│ MISSION         │
└─────────────────┘               ┌───────┬──────────────────┐  *
                                  │ /\/\/\│ BUSINESS DEFINI- │
                                  │       │ TION / UNIT MISSION │
                                  │ /\/\/\│ STATEMENT        │
                                  └───────┴──────────────────┘
```
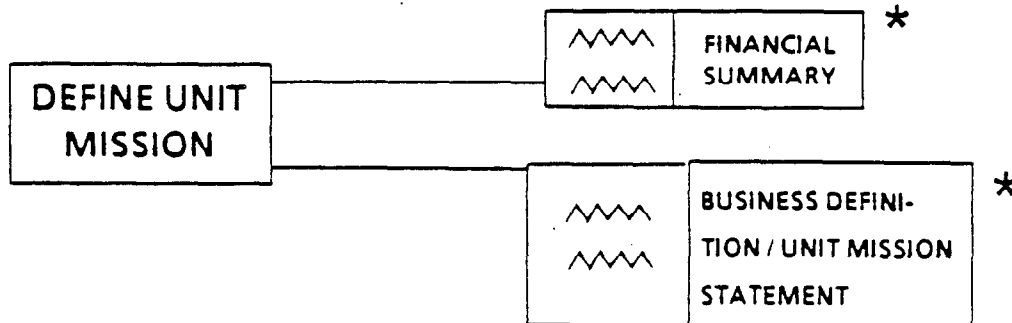
This involves defining which business unit the plan is for. Where a
plan is being produced for an organisational unit, this simply involves
identifying the unit. But it may be more complex: one may wish to
carry out the plan just for a subset of an organisational unit's business
of particular interest, or for an area of the business that crosses
organisational boundaries. For example, a plan for tinned foods
within a foods company may cross department boundaries of design,
production, finance, etc.

The output is a definition of the business unit, including a title that can be used to head all documents associated with the plan.

It may be possible to produce a checklist to assist in this function.

Financial Summary

Any financial targets set for the unit, particularly for revenue or profit. This also involves specification of the planning period to the end of which the targets relate (typically 3 years).

Business Definition/Unit Mission Statement

A statement in words to cover aspects of the mission not covered by the Financial Summary. Brief statements should be made which cover the followings points:

i)   Role or Contribution of the Unit

       eg. - profit generator,

             - service department,

             - opportunity seeker

ii)   Definition of the Business

       - the needs satisfied or the benefits provided. Should not be too specific (eg. "we sell milking machinery") or too general (eg. "we're in the engineering business").

iii) Distinctive Competence

       - this should be a brief statement that applies only to the specific unit. A statement that could equally apply to any competitor is unsatisfactory.

iv)   Indications for Future Direction

       - a brief statement of the principal things that serious consideration would be given to (eg. move into a new segment).

Focus

| ∿∿∿ | STATEMENT OF FOCUS |

*
market segments and
products relevant now
and in future (inc hierarchy)

FOCUS

Identify 20%
critical to
business

| ×⊹× | PORTER MATRIX |

Segment
market

| ⁝≡ | S.I.C. |

Predict next
3 years

| ⌐□ | LIFE CYCLE |

| ×⊹× | ANSOFF MATRIX |

| ⌐ | COST EXPERIENCE CURVE |
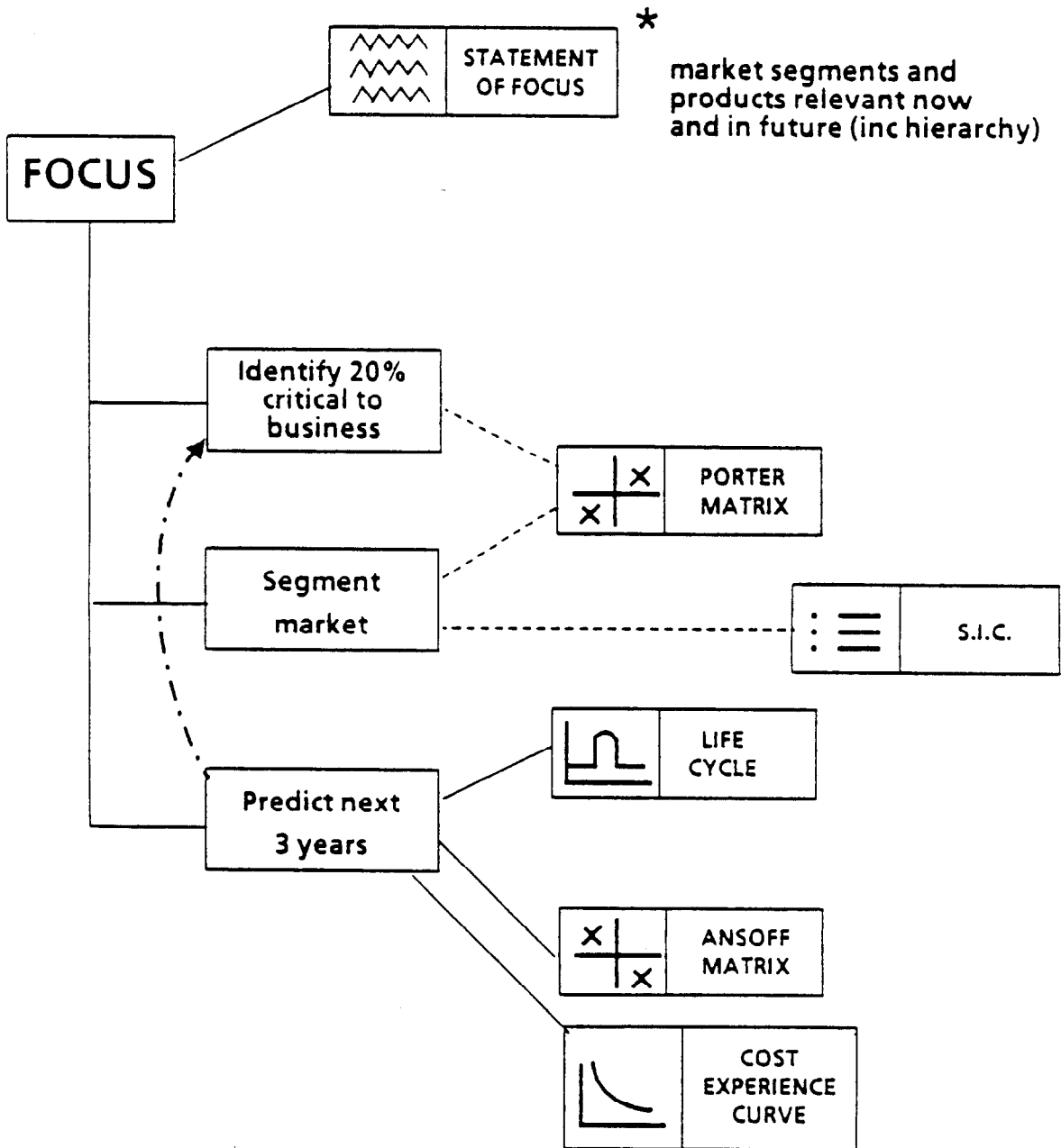
Focus

The object is to identify which market segments and products are to be considered in production of the marketing plan. This involves ignoring some detail for the sake of aiding understanding about the critical issues involved. For example, an audit of tinned foods may decide to focus on baked beans and pet foods, and ignore the small market for anchovies.

Identify 20% Critical to Business

The basic rule of thumb is that the 20% of the organisation's markets and products most critical to its success are those that should be included in a strategic marketing plan. This is a guideline only: the planner may wish to conduct a more or less exhaustive plan. The Porter Matrix may assist by showing the relative strength of the products in their markets in terms of differentiation and cost leadership, as an indication of the possible future importance of the products.

Segment the Market

The relevant markets should be identified and, where appropriate, segmented. This is in general a creative and important step. Limited guidance only is incorporated in this model. The Porter matrix may be of assistance in market segmentation, as clusters of products in similar positions might reasonably be placed in a segment. The Standard Industrial Classification (SIC) used as a basis of statistics collection by the Government can form a useful starting point for market definition, as a checklist from which to select, though it is not always appropriate.

Predict Next 3 Years

Prediction of the future prospects of the products, all other things being equal, is important as an input into the audit of the current position. It is also an important validation step, as it may affect which 20% of the products and markets are deemed to be critical. For example, if the demand for anchovies is expected to rise steeply in the next three years, it may be decided to include them in the tinned foods audit after all.

Consideration of where the product is in its life cycle may assist in prediction. The Ansoff matrix may already at this point suggest new markets and products that should be defined and considered. The cost experience curve may suggest what is likely to happen to the costs of the products, which may have implications for its future prospects.

CONDUCT AUDIT
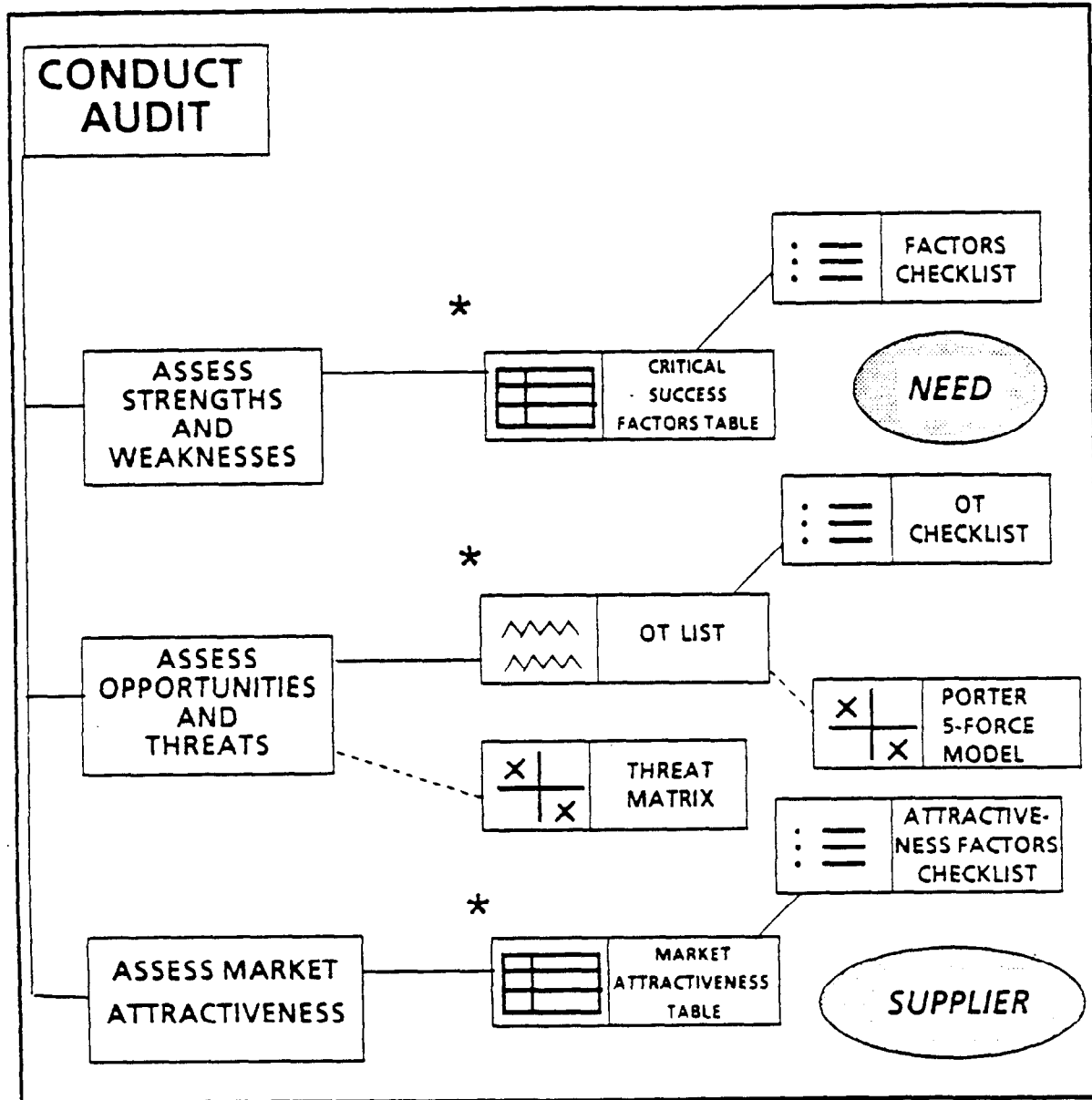
*

ASSESS STRENGTHS AND WEAKNESSES — CRITICAL SUCCESS FACTORS TABLE — FACTORS CHECKLIST

NEED

*

ASSESS OPPORTUNITIES AND THREATS — OT LIST — OT CHECKLIST

PORTER 5-FORCE MODEL

THREAT MATRIX

ATTRACTIVE-NESS FACTORS CHECKLIST

*

ASSESS MARKET ATTRACTIVENESS — MARKET ATTRACTIVENESS TABLE

SUPPLIER

The objective is to assess the state and prospects of the products and markets already identified. Information needed at this point may have been collected in advance of the planning process, or it may be collected now.

Assess Strengths and Weaknesses

The strengths and weaknesses of the company's products in its markets can be summarised in a Critical Success Factors table. It is very important to get this right, and to validate it against information on the competitors in the market and their strength in the markets. If the information is not available to sufficient accuracy, it should be obtained. After all, one is identifying factors critical to the success of the business. A checklist is available of possible factors to consider.

Assess Opportunities and Threats

The Porter 5-force model of pressures on you can assist in identification of threats. The Threat Assessment matrix gives guidance on whether to include the threats in the summary list. A checklist of possible opportunities and threats is available.

Assess Market Attractiveness

The Market Attractiveness table summarises the attractiveness of a market to the company. It thus complements the Critical Success Factors (CSF) table: CSF summarises the company's prospects of success in the market if it chooses to compete, whereas this table summarises the desirability of competing. One important aspect of the market's attractiveness is the expected future of the market: in this way, the market attractiveness table may be more forward looking than the CSF table.

SUMMARISE

x |
--+--
  | x   BOSTON MATRIX

x |
--+--
  | x   DIRECTIONAL POLICY MATRIX   *

GAP ANALYSIS

ANALYSIS SUMMARY   *
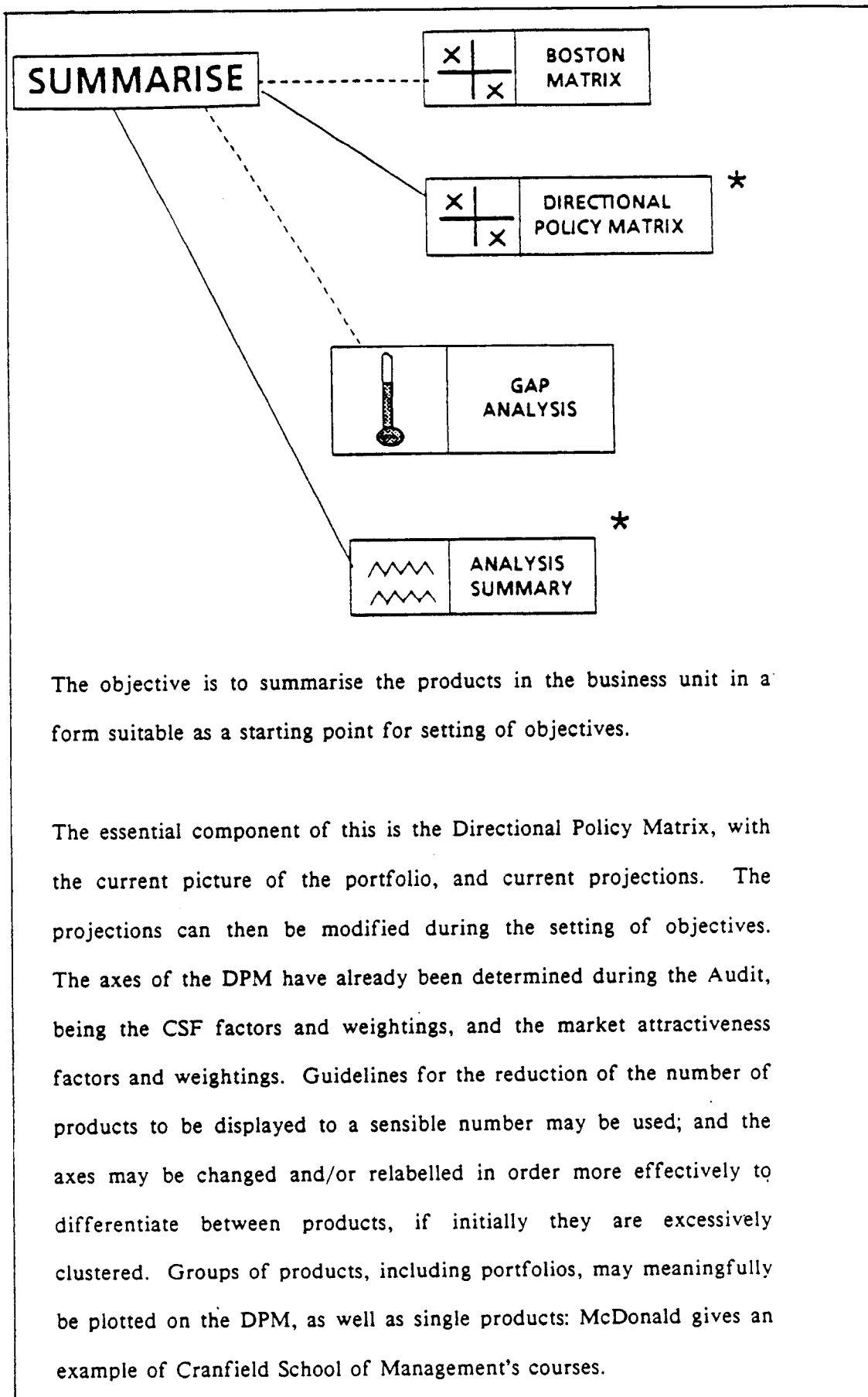
The objective is to summarise the products in the business unit in a form suitable as a starting point for setting of objectives.

The essential component of this is the Directional Policy Matrix, with the current picture of the portfolio, and current projections. The projections can then be modified during the setting of objectives. The axes of the DPM have already been determined during the Audit, being the CSF factors and weightings, and the market attractiveness factors and weightings. Guidelines for the reduction of the number of products to be displayed to a sensible number may be used; and the axes may be changed and/or relabelled in order more effectively to differentiate between products, if initially they are excessively clustered. Groups of products, including portfolios, may meaningfully be plotted on the DPM, as well as single products: McDonald gives an example of Cranfield School of Management's courses.

The Boston matrix may be used if it is appropriate in this case, on the grounds of its greater simplicity. Similar remarks apply to those above about the DPM.

A financial gap may be ascertained at this point between a unit financial objective and the current projections. This gap is notated on the diagram as a thermometer, as in essence it simply records a gap between two values, though the traditional graphic representation has the advantage of recording the value of a third dimension of the current position.

Similarly, a "strategic gap" may be identified between other objectives of the unit included in the mission statement, and their anticipated fulfilment on the basis of current predictions of the unit's products and consequent work. This may be to do with maintaining the synergy of the organisation. Such a strategic gap would be recorded in an Analysis Summary.
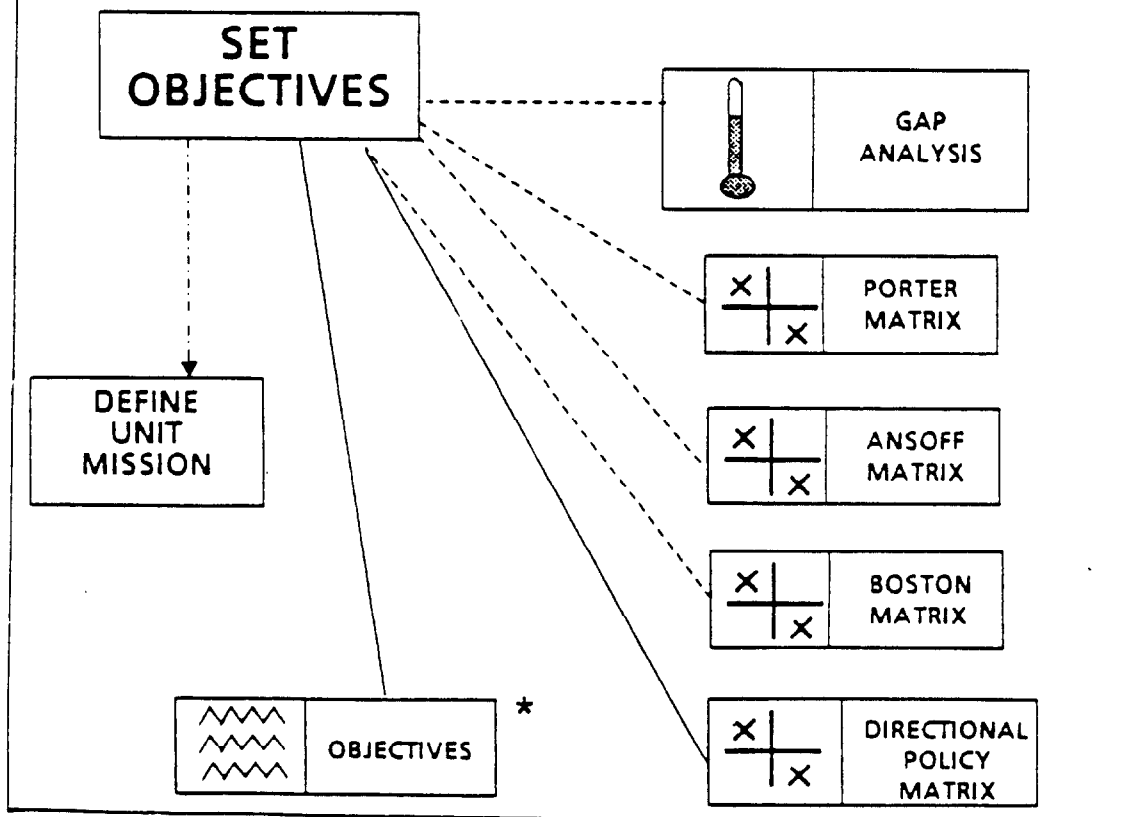
The purpose of this function is to produce a list of objectives. These should be quantified, but beyond this the possible types of objectives have not been identified.

Gap Analysis may be used to drive this process, by attempting to close the gap starting with productivity improvements, then considering new markets and new products in the order suggested by the Ansoff Matrix, and finally by considering changing the business's assets (changing the nature of the business) in order to meet the objective. At any point, changing the objective may also be an option. This is the reason for the feedback line to "Define Unit Mission".

The DPM suggests "directional policy guidelines" for each product/product group plotted on it. These are taken into account in setting objectives for the product or product group. The Porter matrix may provide further help in this. Boston may be used, if, again, its implications are acceptable in this case.

```
┌─────────────┐          ┌──────┬──────────┐ *
│     SET     │──────────│ ∧∧∧∧ │          │
│  STRATEGY   │          │ ∧∧∧∧ │ STRATEGY │
└─────────────┘          └──────┴──────────┘
```

The strategic steps needed to meet the objectives are identified and recorded. The model has not yet been extended to cover this in any more detail.

<u>Data Model</u>

<u>NOTATION</u>

The data model diagrams presented later in the section are in a format
known as Entity Relationships Diagrams. The diagram below is used
to explain the notation.

```
        ┌─────────────┐
        │             │  `• Size
        │   MARKET    │
        │             │
        └──────┬──────┘
               ▲
               │
               │
            is sold
            into
               │
               ▼
        ┌─────────────┐
        │             │  • Costs
        │  PRODUCT    │
        │             │
        └─────────────┘
```
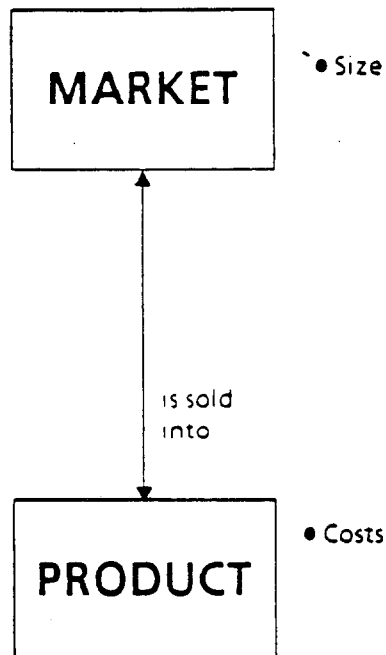
Boxes represent "entities" and lines represent "relationships". An entity
is anything you wish to hold information about, such as Products and
Markets. The information can be represented by blobs by the box,
with text describing the information. Each item is called an attribute,
such as a market's size. A star in place of a blob indicates an
attribute that can be used to identify the particular entity concerned.

A relationship represents some connection between the entities. For
example, products are related to markets in that a product may be sold
into a given market. An arrow leading from entity A to entity B
indicates that a given instance of entity A may be related to more
than one of entity B. Text by the line may be used to indicate the
nature of the relationship. So a product may be sold into more than

one market, and a market may have more than one product sold into it. The case, where there is an arrow at each end, is called a many-to-many relationship.

Data Model (I)

MARKET OR MARKET SEGMENT

* name
● need fulfilled (defn.)

● Size
● growth info (L C)
● C S F.'s

BUSINESS UNIT

● Definition
● Planning period
● Relation to organisation structure

(self or competitor)

OBJECTIVE

is sold into

PRODUCT

BASIC PRODUCT

COMPOSITE PRODUCT

PORTFOLIO

* name
● costs
● new/existing

(self or competitor)
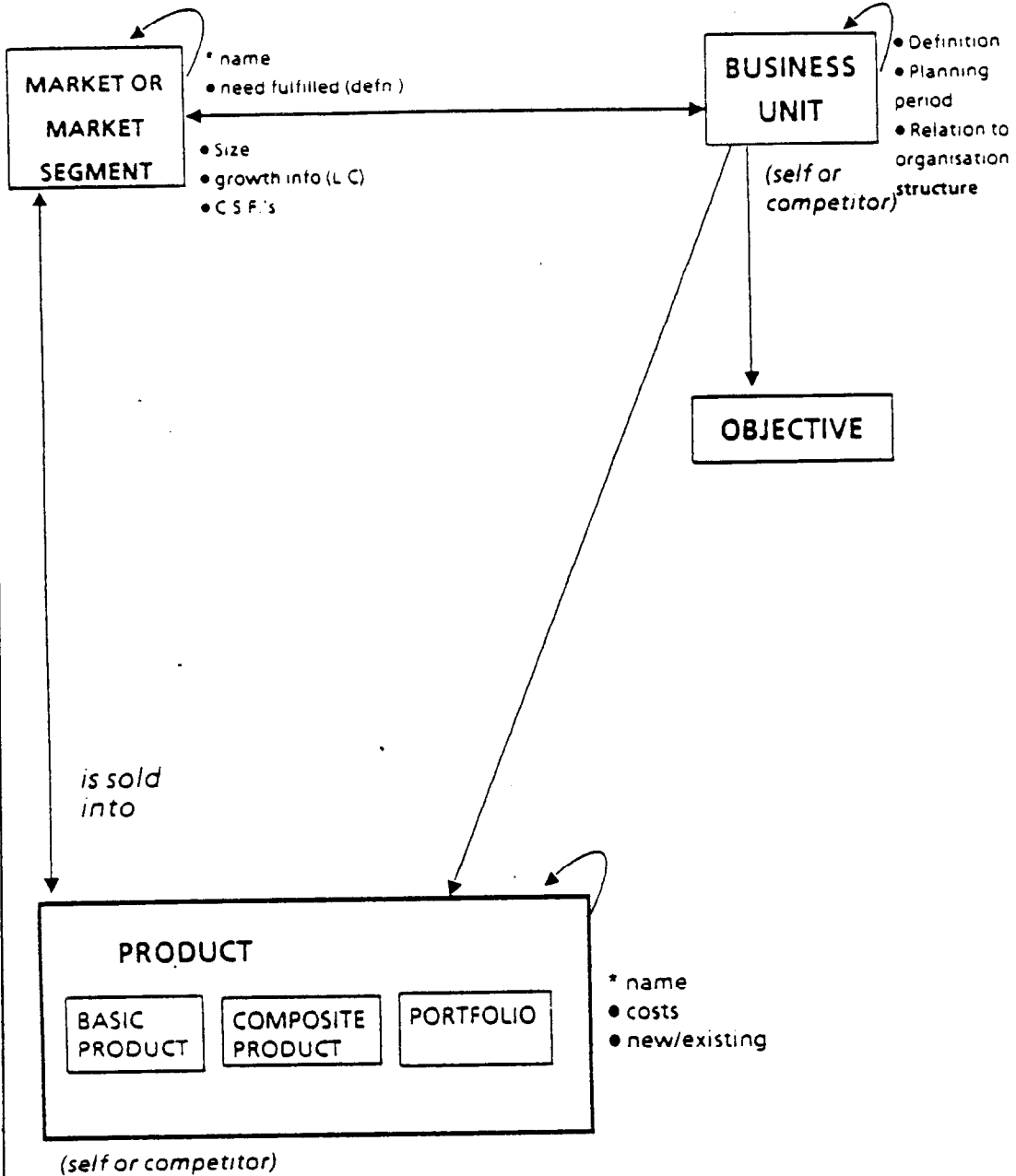
This gives a simplified data model, as a step towards the full model, described in the next section. Products are in a many-to-many relationship with markets they are in, as are business units. Products, markets and business units may all be nested within others.

Composite products are products consisting of several other products, which are sold individually as well. An example might be a variety pack of cat food. A portfolio is a set of products that, by contrast, is not sold as a set, but which is in some way related. The total range of cat foods offered in an example. If a product is neither of these, it is called a basic product.

The critical success factors and weightings that apply to a given market are common to all competitors in the market, so they are an attribute of the market itself in the model.

This diagram is inadequate when you consider information such as market share. Market share is not an attribute of products: a given product may be sold into two markets, in each of which it has a different market share. So a new entity is needed "between" Product and Market. Similarly, the attractiveness of a market to a given firm is specific to that firm, so a new entity is needed between Market and Business Unit.

Data Model (II)

```
                                        ●Market attractiveness
                                        factors (MAFs)
  ⤴                                                              ⤴
┌──────────┐  * name          ┌──────────┐  ● Score on MAFs,   ┌──────────┐
│ MARKET OR│  ● need fulfilled │ INVOLVE- │  and overall score │ BUSINESS │
│ MARKET   │───(defn )────────▶│ MENT IN  │◀───────────────────│  UNIT    │
│ SEGMENT  │  ● Size           │ MARKET   │                    └──────────┘
└──────────┘  ● growtn info (L.C)└────────┘   (self or          ● Definition
     │        ● C.S.F.'s      (actual or potential)  competitor)  ● Planning
     │                                                            period
     │                                                          ● Relation to
     │                                                            organisation
     │                                                            structure
     │                                                               │
     ▼                                                               ▼
┌──────────┐  ● differentiation (1-10)                        ┌──────────┐
│ PRODUCT FOR│ ● market share                                 │ OBJECTIVE│
│ MARKET   │  ● costs                                          └──────────┘
└──────────┘  ● score on CSFs, + overall score
     ▲        ● new/existing
     │        ● price/average price
     │        ● sales volume
     │
  is sold
  into
     │                                                  ⤴
┌────┴──────────────────────────────────────────┐
│  PRODUCT                                        │
│                                                 │  * name
│ ┌──────┐ ┌─────────┐ ┌──────────┐              │  ● costs
│ │BASIC │ │COMPOSITE│ │PORTFOLIO │              │  ● new/existing
│ │PRODUCT│ │PRODUCT  │ │          │              │
│ └──────┘ └─────────┘ └──────────┘              │
└─────────────────────────────────────────────────┘

(self or competitor)
```

An important area in which this model needs extension is in modelling of features that change over time. This is only loosely described at present, for example by the attribute "Growth info" for markets. One possibility is to have a different entity for each year (or other period) under consideration - so you might have six Market entities, one for each year from three years ago to the end of the planning period in three years' time, with differing information as to market size and critical success factors. An intermediate possibility would be to have some information that is static over time, and other information in a separate dynamic entity. This needs investigation.

Technique Interrelationships

DATA USED BY TECHNIQUES

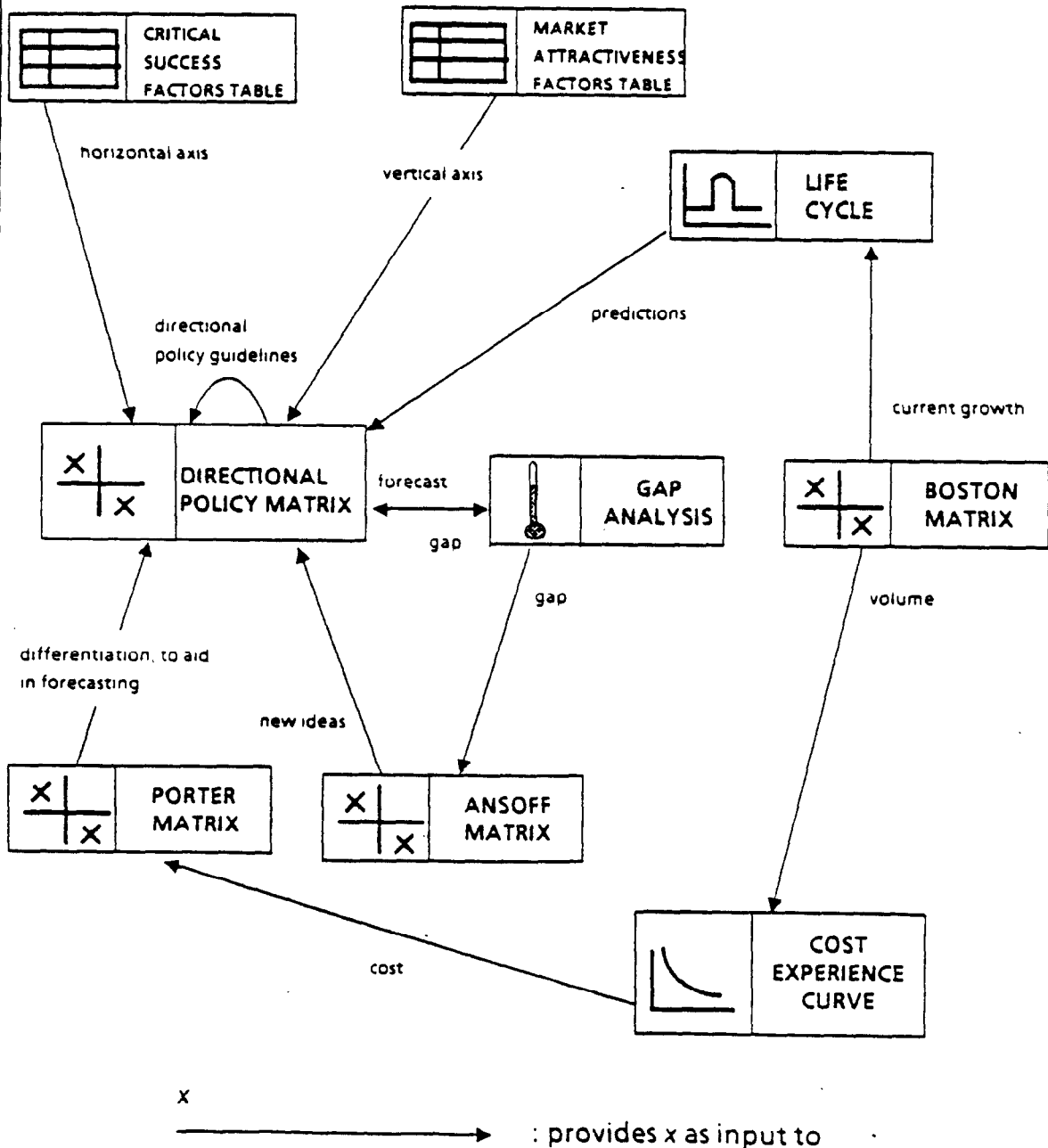The diagram below shows the data used as input by some of the techniques modelled.
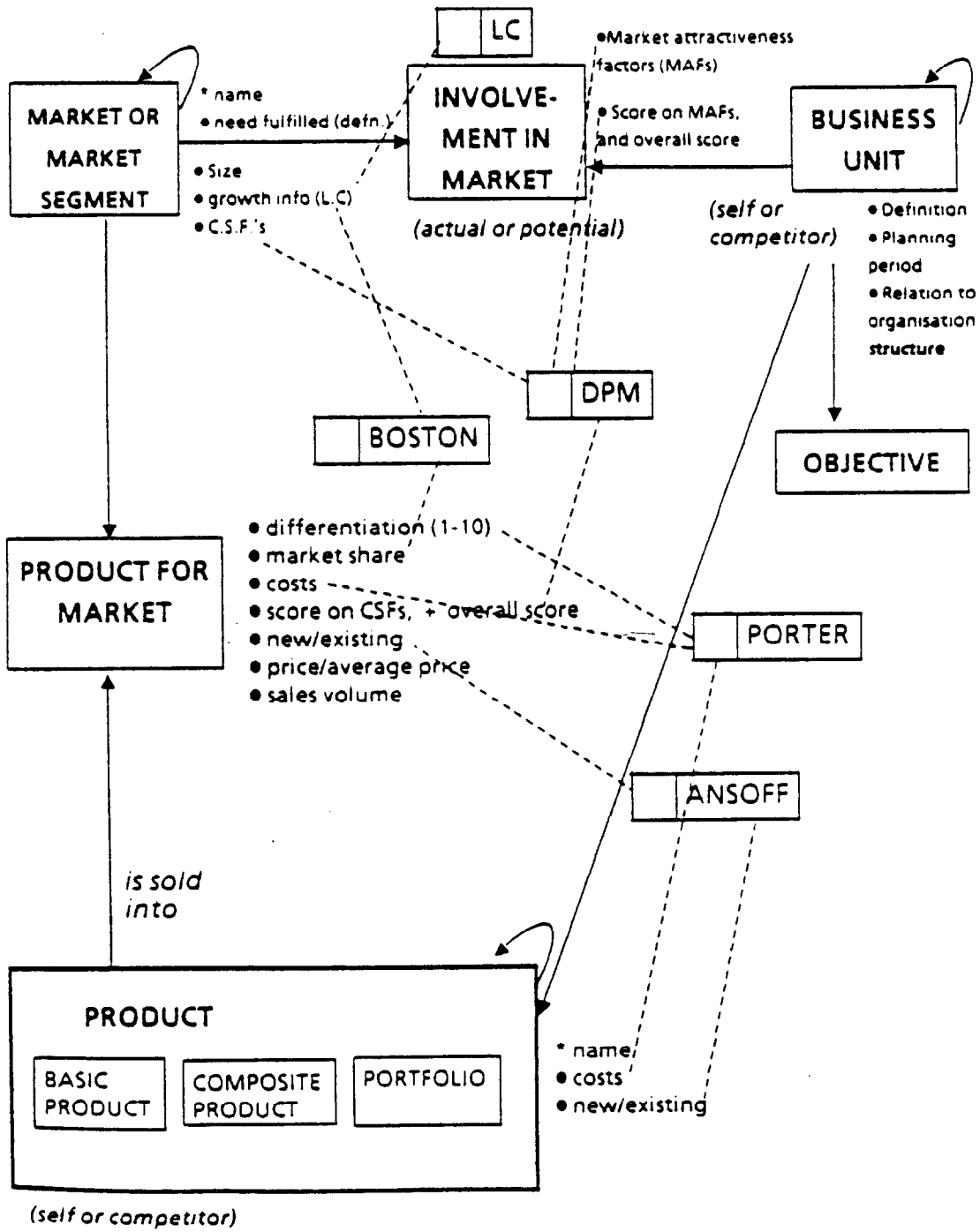
Technique interrelationships

The diagrams below show various connections identified between techniques. They assume that by using a technique, any data required by it is entered into the model by some means, so that data is available for another technique.

TECHNIQUE INTERRELATIONSHIPS (1)

CRITICAL SUCCESS FACTORS TABLE

MARKET ATTRACTIVENESS FACTORS TABLE

LIFE CYCLE

horizontal axis

vertical axis

directional policy guidelines

predictions

current growth

DIRECTIONAL POLICY MATRIX

forecast

GAP ANALYSIS

gap

BOSTON MATRIX

differentiation, to aid in forecasting

gap

volume

new ideas

PORTER MATRIX

ANSOFF MATRIX

COST EXPERIENCE CURVE

cost

x

————————▶ : provides x as input to

Technique interrelationships (II)

- LIFE CYCLE
- BOSTON MATRIX
- GAP ANALYSIS
- PORTER MATRIX
- ANSOFF MATRIX
- COST EXPERIENCE CURVE

directional policy guidelines

future growth

current growth

gap

forecast

gap

differentiation, to aid in forecasting

new ideas

cost