AN EVALUATION OF STYLES OF IT SUPPORT FOR MARKETING PLANNING

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ABSTRACT

IT support for marketing planning can aid in the use of marketing tools, facilitate group planning, and support moves towards continuous planning based on a live marketing model of the business. But amongst other factors, achieving these benefits depends on the style of support provided by the system. In the context of a review of schools of decision support system (DSS) development, we describe here the influence of a qualitative evaluation of a system named EXMAR on the style of support provided by subsequent versions. Our findings support Little's (1970) classic rules of 'decision calculus', such as the importance of ensuring that managers understand and can control the system, rather than the management science influenced objective of prescribing an optimal recommendation. We also emphasise the role of systems in enhancing mutual understanding in a cross-functional planning team, and hence in building commitment to the resulting plan.

INTRODUCTION

> "Ideals are dangerous things. Realities are better. They wound, but they're better."
>
> Oscar Wilde, *Lady Windermere's Fan*

There is a school of thought led by academics such as Mintzberg and Johnson which would readily subscribe to the view that planning manuals created in splendid isolation by strategists in HQ planning departments generally fail. Planning can so easily become a form-filling exercise conducted either to add credence to pre-existing intuitions, or worse, simply to document a continuation of past policy without any creative thought. Indeed, a best practice strategic marketing planning research club at Cranfield established by some of the world's largest companies put lack of insight at the very top of their list of failures in current bureaucratic planning systems. Can marketers be forced to peer over the parapet at the realities of customers' needs and perceptions by the intervention of computer-based planning tools? Can such tools bring insight to what is essentially a logical process? Hardly. But one argument for the institution of IT-enabled models of the marketplace is that the model's inputs can at least encourage the right questions to be asked. And if the resulting inputs are sound, the model's outputs can challenge its users to align their perceptions more closely with reality.

The evidence for establishing what benefits are in fact achieved or not achieved by users of IT enabled models contributing to marketing planning, and for identifying success factors for achieving these benefits when implementing such systems within an organisation, were fully addressed in Wilson (1996), and were addressed more partially in Wilson and McDonald (1994a) and Wilson and McDonald (1994b).

Achieving these benefits does depend, though, on the system design and the style of decision-making support which it offers. In the language of the evaluation literature, we leave aside in this paper questions of summative evaluation - one designed to judge the merit of the evaluand, that is, the system - and concentrate on formative evaluation - one with the aim of improving the evaluand (Shadish et al 1991).

We have been exploring the various impacts of software support on marketing planning for over a decade, through the iterative development and evaluation of a system called EXMAR, as well as through studies of the efficacy of other bespoke and packaged systems (Wilson and McDonald 1996). We briefly described an early version of the EXMAR system in McDonald and Wilson (1990). We believe there are wider lessons to be learned from our subsequent experience with several versions of the system, hence this paper, which focuses on the evolution of the style of support offered by the system. As well as describing the various versions of the program, we draw on a 'system design evaluation' of the system carried out with six UK companies to inform a discussion of the most appropriate styles of support for such marketing tasks.

However, the fact that for this system summative evaluation issues have already been thoroughly addressed, a rare occurrence in this field (O'Keefe 1989), adds to the motivation for this paper - to explore how the benefits identified have been arrived at, and indeed why certain other benefits have not occurred, in order to assist future developers. A further motivation is provided by the wide usage of this particular system in live planning in the UK and elsewhere.

We start by reviewing some styles of decision support from the literature, before describing the various versions of the EXMAR system and how they were influenced by the system design evaluation. We then explore the wider implications for decision support in marketing.

STYLES OF DECISION SUPPORT

The term 'decision support system' (DSS) does not have a clear definition, despite its use since the early 1970s. Stabell (1986) regards its key characteristic not as a technical one, but rather as being the context in which the systems are to be used. He therefore defines DSS as: "systems developed to support managers' decision making processes in complex and ill-structured decision situations". The reference to the degree to which decisions are structured refers back to Gorry and Scott Morton (1971), who defined DSS as supporting semi-structured and unstructured decisions, structured decisions being in their terminology part of the role of "management information systems" (MIS).

Others prefer to focus on the distinction between data-oriented and model-oriented programs (Hirst 1991). Keen (1980) suggests that those researchers who regard DSS as a subfield of MIS equate decision support with providing managers with access to data, while those who regard DSS as an extension of Management Science techniques equate DSS with providing access to analytic models. Alter (1987) persuasively argues that this distinction is really a continuum rather than a dichotomy.

Given the looseness of the definition of DSS, it is not surprising that there are a number of approaches to their development. We discuss five broad schools, or strands in the literature: decision calculus; decision analysis; decision research; implementation process; and expert systems.

John Little's influential paper (1970) which started the **decision calculus** 'school' began with the still pertinent observation that "The big problem with management science models is that managers practically never use them". He went on to argue for model-based systems which are simple (easy to understand); easy to control (it should be possible to change the input to get desired output); easy to communicate with (implying the importance of the user interface); robust (it should be difficult to get meaningless answers); as complete as possible (if necessary through incorporation of judgemental estimates), and adaptive (the model can be adjusted as new information is acquired). The 1970 paper described BRANDAID, a system modelling advertising effectiveness. Lodish (1981) described other applications of Little’s approach in marketing, including CALLPLAN, which helped salespeople to allocate their time among accounts and prospects. He too emphasised the importance of ease of control, in remarks which are pertinent to this study:

> "Before the salesmen got their first results at the computer terminal, their initial reaction was one of caution and skepticism. However, experience with the interactive program transformed this attitude into varying levels of enthusiasm as the salesman realized that he was controlling the program, rather than it controlling him. Once the salesman realizes that all the computer and model are doing is a lot of arithmetic and evaluations that the salesman would like to do but could not do because of limitations to his computing power, his attitude towards the model changes very dramatically."

Decision analysis, at least as commonly used within DSS literature, addresses the problem of choosing between options under uncertainty with multiple goals (Stabell 1986; Wind and Saaty 1980). A decision is typically summarised as a decision tree (Phillips 1989). The Analytic Hierarchy Process is frequently (Wind and Saaty 1980), but not invariably (Phillips 1989), used to formalise this numerically with a tree structure of scores and weights. The Analytic Hierarchy Process contrasts with Little's approach in that in our view it is hard for the user to understand the linear algebra-based mathematics performed by the computer without a mathematics degree. Wind and Saaty's argument is that the test of a method is its reliability and validity in reaching an answer. Little's argument is that if users can't understand it, they won't use it, and that in any case use of a system is as much to do with an "updating of his intuition" as reaching an immediate decision.

The **Decision research** and **implementation process** schools primarily address the means by which a DSS is built rather than the end result (Stabell 1986). Decision research advocates that the decision maker's current behaviour must be understood before it can be modified through a diagnosis of opportunities for improvement. Implementation process, also known as adaptive design (Keen 1980) or evolutionary development, advocates use of prototyping to get started quickly, with gradual improvements and extensions to the system (Iivari and Karjalainen 1989). A major criterion for success for the implementation process school is that the system that is developed should be used, whereas decision research, having understood the decision-maker's behaviour, wishes to modify it with the help of a computer system towards some more ideal state. Keen (1980) went as far as asserting that:

> "the label "support system" is meaningful only in situations where the "final" system must emerge through an adaptive process of design and usage".

He justified this through the observations that semi-structured tasks are characterised by a difficulty in laying out procedures and requirements in functional specifications; that users do not know what they want and so an initial system must be built to provide users with something to react to; and that:

> "the actual uses of DSS are almost invariably different from the intended ones; indeed, many of the most valued and innovative uses could not have been predicted when the system was designed".

The term DSS is often taken to include **expert systems**, which in their attempt to mimic human experts are in general aiming to support human decision making. The origins of expert systems in research into artificial intelligence (AI) give rise to their particular flavour: the attempt to capture the expertise of a domain expert in a computer system. This is a hyperbole-laden area in which prescription far outweighs practice (Wright and Rowe 1992). The vast literature on expert systems, including 500 dissertations in a search of *Dissertation Abstracts*, compared with 200 on DSS and 29 on marketing planning, contrasts with the experience of one of the authors in a 50-strong artificial intelligence company, which in six years delivered no successful commercial expert systems (though delivering a number of other systems using expert systems' enabling technologies). Most of the employees concluded, with John Seely Brown (1984), then director of the influential Xerox Palo Alto Research Center:

> "The real payoff of Artificial Intelligence during the next few years may not be in expert systems, but rather in commercially exploiting the artificial intelligence mentality (a mentality for coping with ill-defined, constantly-changing problems), and the intelligent programming environments that have emerged to enable AI researchers to cope with immensely complex problems."

This anecdotal observation is confirmed by statistics gathered by Mingers and Adlam (1989) that of 1,000 articles on expert systems published in 20 journals from 1984 to 1988, only ten were in regular use.

What constitutes an expert system (or the related term 'knowledge-based system') is a contentious issue (Doukidis 1989). It can be argued that any computer system incorporates expertise in a sense - even, say, a payroll system, which incorporates the rules for calculation of pay and deductions, traditionally within a procedural programming language. Brown (1984) usefully distinguishes between the "low road" of embedding the expertise in data structures and procedures (as in this payroll example), the "high road" of an explicit, "deep" representation, and the "middle road" of an explicit but heuristic representation based on rules of thumb. Much of the literature (Luconi et al 1986; Chadha et al 1991; Rangaswamy et al 1989), though not all (Bobrow et al 1986; Aitken and Bintley 1989; Duan and Burrell 1995), assumes a technical definition of expert systems based on the "rule-based" middle road, generalising considerably from some early successes such as MYCIN (Buchan and Shortliffe 1984) which tackled a problem in medical diagnosis, and XCON, a system for configuring computer systems (Barker and O'Connor 1989), and providing a large literature of prescriptions about such issues as how the system should be structured and how it should be developed. While this approach has proved promising for such applications as international negotiations (Rangaswamy et al 1989), the disadvantage of such technical definitions is that they exclude systems that in some sense mimic human experts, but that are built with a different technical approach (Bobrow et al 1986a; Duan and Burrell 1995).

A similar problem with definition occurs with **group decision support systems (GDSS)**, a subset of decision support systems often discussed in the literature (Pinsonneault and Kraemer 1989). These aim to support a group of decision-makers rather than an individual. This distinction cuts across the schools discussed above. While normally thought of technologically through the use of 'multi-user' hardware and software, for example through decision conferencing rooms equipped with special equipment (Nunamaker et al 1988), it is possible to regard some single-workstation systems as supporting group work, if for example they make it easy to share information via diskettes or networks (Trigg et al 1986), or simply if the outputs are used as part of group decision-making. Hence, definitions may concentrate on the use of the system by a group, for example Kraemer and King (1988), who defined a GDSS as any computer and communication based support of group work including, but not limited to, decision making.

This definition also raises the debate, which we have already touched on, as to whether DSS necessarily support decision-making as opposed to other activities or tasks. Alter (1987) simply distinguishes DSS which "facilitate management, planning or staff activities" from electronic data processing systems which "emphasize intrinsically clerical activities". Looking specifically at group systems, Pinsonneault and Kraemer (1989) distinguish group communication support systems, which "primarily support the communication process between group members", and GDSS, which "attempt to structure the group decision process in some way". Vogel and Nunamaker (1990) review the emerging use of terms such as 'group *deliberation* support system', 'group *process* support system' and the simpler 'group support system', in order to capture the notion that systems known as DSS have roles including communication and information processing as well as support for decision-making.

We have already quoted Keen (1980) as using the term "support system", which is understandable given his observation (based on a review of live systems) that:

> "While the orthodox (academic) faith views DSS as tools for individual decision makers, users regard the concept as more relevant to systems that support organizational process. They also feel they do not really use DSS for decision making."

In Keen's view, benefits instead relate to improved communications, insight and learning.

Turning, then, to a working definition of DSS for purposes such as this study, we would not wish to rule out the possibility that systems that aim to assist with marketing planning might have impacts in such areas as "improved communications, insight and learning", these being as much a key output of marketing planning as is the taking of decisions on, for example, resource allocation. Although we will use the term "decision support system" because of its common usage, we do not, therefore, wish to assume that its only purpose is to support decision-making. We also find Alter's (1987) distinction between "management, planning or staff activities" and other activities problematic. We therefore follow many previous definitions (Stabell 1986, Benbasat and Nault 1990, Eom and Lee 1990) in making use of Gorry and Scott Morton's (1971) concept of decision or task structure, defining a DSS as:

A system which aims to support unstructured or semi-structured tasks performed by individuals or groups, including but not limited to decision-making.

We will now turn back to EXMAR, describing the system and its formative evaluation before discussing its location within these debates on styles of decision support.

SYSTEM DEVELOPMENT STAGES AND EVALUATION METHOD

The EXMAR system was developed and evaluated over several iterations as follows:

Demonstrator development: there was a conceptual research stage to develop a formal marketing planning model as a basis for computerisation, followed by development of a demonstrator system using the Lisp programming language in order to provide, in a short time-scale, a vehicle for discussion with potential users of the scope, content and style of the system. This was the system version described in our earlier paper on the system itself (McDonald and Wilson 1990). The underlying marketing planning model, or formalised process, was described in Wilson and McDonald (1997).

Prototype development: a sufficiently robust prototype system was developed to allow evaluation in the field, using the Smalltalk programming language.

System design evaluation: there was a qualitative evaluation using 13 semi-structured interviews and user-completed reports with six UK companies from different market sectors, who used the prototype system on a trial basis. The aim of the evaluation was to improve the design of the system itself.

Full system specification and development of MacroScope and Visual Basic systems: there was a third specification iteration involving further modelling and system design to incorporate feedback from the system design evaluation, resulting in what we will term the 'full specification', its scope being somewhat wider than the previous versions. Due to implementation difficulties and, in our view, inappropriate choice of development tools, the first implementation of this specification in the MacroScope development environment did not result in a usable system, but it did serve to illustrate part of the specification in software. The subsequent implementation of much of the specification in the Visual Basic language was completed in 1996 and has been refined continually since then.

As we have mentioned, further summative evaluation stages also occurred which are outside the scope of this paper.

The system design evaluation was conducted by training marketing and strategy managers in six companies in how to use the software, which was installed on a PC within each company. They then developed a marketing plan using the system, and wrote a report on their conclusions about the system's utility and how it might be improved. The companies were chosen to cover a variety of market sectors, and to incorporate capital, other industrial, consumer and service products. The vertical markets covered were aerospace, engineering, consumer goods, computing, banking and insurance.

The results of less structured pilot evaluation work were used to define the categories under which information was collected. These were incorporated in a report structure that the companies were asked to follow in their reports. This structure included open-ended questions under each heading, using wording which followed questionnaire design guidelines in avoiding bias and so on (Lofland and Lofland 1984). In addition, thirteen semi-structured interviews, averaging three hours' duration, were carried out to gather background information on the companies and their planning, and to explore selected areas in more depth. Tape recordings were not made, but interviews were noted in detail and written up in full typed notes. Further details of the research method are contained in Wilson (1996).

EXMAR SYSTEM SCOPE

Before considering the styles of support offered by the various system versions, we aim here to convey a flavour of the system's content by describing the scope of each version. The system's overall scope can be summarised as follows:

> *The system guides the user through a marketing planning process, prompting for qualitative and quantitative data, validating and relating this data, checking the data for consistency, offering advice at key stages, presenting information in various ways so as to assist in the setting of objectives and strategies, and generating a first-cut marketing plan document.*

Each version's scope is summarised in terms of stages of the marketing planning process in Table 1, and in terms of planning techniques supported in Table 2.

[TAKE IN TABLE 1]

[TAKE IN TABLE 2]

STYLES OF SUPPORT IN EXMAR

Within this scope, what is the nature of the system's support for planning? Table 3 lists some relevant issues in the left-hand column and summarises the differences between the EXMAR versions. Table 4 summarises the feedback from the system design evaluation against the same headings. The tables should be read in conjunction with the following discussion, which traces the changes to these system 'features' in the various EXMAR versions. We will return to the role of these features in delivering benefits in the next section.

[TAKE IN TABLE 3]

[TAKE IN TABLE 4]

Process support

By 'navigation' we mean how users find their way around the system (Canter et al 1985), an important aspect of how the system supports the planning process. In the demonstrator, this is achieved using a 'tree' representation of the marketing planning process hierarchy (for screen snapshots see McDonald and Wilson (1990)). This process hierarchy, which forms part of the underlying marketing planning model, divides the planning process into stages, and breaks each into more detailed steps. The user clicks on the step to be performed next. While the demonstrator indicates which steps are regarded as compulsory and which are optional, it does not endeavour to control which steps are actually performed - a feature common to all the versions of the system. The user is also free to perform tasks in any order. These decisions arose from the nature of the marketing planning model. The limited specification in the model of where iteration to earlier stages in the process might be appropriate, combined with the fluidity of the ordering of the steps within the process, suggested that it was important not to restrict the user to the suggested ordering of tasks.

While the prototype includes a similar tree diagram, its primary means of navigation, termed the Action Panel, is organised around data rather than process. On the Action Panel, one first selects which data item one wishes to work on, such as a product-market. The various data forms available for a product-market can then be selected with buttons on the panel. Other buttons provide other facilities such as the directional policy matrix (DPM) (Hussey 1978).

This change from an interface organised around process to one organised around data took a step further the notion that the ordering of tasks cannot be rigidly defined. The rationale was that the Action Panel would allow quick access to any part of the system at random. However, feedback from the system design evaluation suggested that the Action Panel was hard to learn. Given the limited time available to users, ease of learning was at least as important as ease of use for the experienced user.

The next version therefore returned to an organisation around a tree diagram of the process, albeit with a simplified and rationalised process hierarchy. The Visual Basic system follows the same rationalised process, using a series of pull-down menus, supplemented by a view of the whole process in an 'outlining' tool.

If the user is to be allowed to perform tasks in any order, feedback on what tasks have been performed is useful to help the user to keep track of what remains to be done. The prototype provided this in a 'Status display', which showed which major stages had been performed for each product-market, by tracking which forms had been filled in. Naturally, this automatic assessment by the system of which steps are 'complete' is an imperfect one, as the user may well wish to iterate over previous data or decisions; but users reported that such automated feedback was better than nothing. This status display concept was taken further in the full specification which followed, although it has yet to be fully implemented.

Data handling

Having prompted for information, the system performs various validation checks and calculations, to check for example that ranges are valid, or that critical success factor (CSF) weights do not total more than 100, or to calculate a weighted average CSF score. Some calculations can be regarded as maintaining constraints. For example, price, volume and revenue satisfy the constraint that price x volume = revenue. Given any two of these numbers, the system can calculate the third. This can be complex, as the constraints interrelate. For example, a change to market share in volume terms causes volume to be changed, which in turn causes revenue to be changed, which in turn updates market share calculated in revenue terms. Each of these can affect other tables showing totals, or graphical displays such as the Boston matrix.

The data being manipulated by the system is 'semi-structured', consisting of a mixture of numeric data and text. In the prototype, text could be entered for any step in the process, which would then form the basis for a plan document. The system provided a template for each step, prompting for appropriate information such as opportunities and threats. This separation of text and the largely numeric data entered on forms arose largely for reasons of ease of implementation. However, it led to some difficulties in relating words to numbers. For example, the user often wished to document the strategies behind changes to CSF scores at the objectives/strategies stage. Because the information was not entered in the same place, it was easy for such information to be lost.

The MacroScope and Visual Basic systems therefore relate words and numbers more closely, space being provided for text on the same form where appropriate. Unstructured notes can be added to any numeric information, using a 'Post-it' metaphor in the MacroScope case: pressing the yellow 'Post-it' brings up a text window, while the 'Post-it' icon changes to indicate when text has been entered against a number.

Data presentation

Each software version generates certain graphics from the data entered by the user. As the underlying marketing planning model spells out how techniques interrelate and draw on common data, further efficiencies can be gained from software, in that data entered once can be re-used in appropriate techniques automatically. The potential of software here is under-exploited by the prototype, as graphics are limited to the DPM and a basic gap analysis. In the Visual Basic system, though, a change to a CSF score, for example, results in changes to the DPM, Porter's cost-differentiation matrix (Porter 1980, 1985), perceptual maps and the CSF bar chart.

Data interpretation

On the whole, interpretation of data, such as drawing conclusions from graphical techniques, is left to the user, with only limited advice from the system. This emphasis results from our view of the nature of marketing planning theory. While the prescriptive literature for several of the techniques has broad advice associated with the position on the graphical display, this advice is tentative and permits of many exceptions. The Boston matrix, for example, assumes that market growth is an adequate measure of market attractiveness, and market share an adequate indicator of business strengths; the position on the relative market share axis can be very sensitive to the manner in which the market has been defined; and the classic advice for the four quadrants assumes a connection between relative market share and relative costs that may not always apply, although some evidence for these assumptions is available from the PIMS work and from data on the experience effect (Kotler 1988; Armstrong and Brodie 1994; Abell and Hammond 1979). Similarly, the DPM can be very sensitive to the scores and, particularly, the weights used, which are often subjectively assessed, while as with the Boston matrix the prototypical movement of product-markets from the 'question mark' quadrant through the 'star' and 'cash cow' quadrants to the 'dog' quadrant is based on product life cycle ideas which do not always apply (Proctor and Kitchen 1990; Kotler 1988). Similarly, Cronshaw et al (1994) provide evidence to challenge Porter's assertion that "a firm that is 'stuck in the middle' is in an extremely poor strategic situation" (Porter 1980 p41), and Bowman and Daniels (1995) report a study showing that functional experience affects the perceptions of a firm's cost/differentiation positioning, showing the sensitivity of the perceived position to subjective factors. Furthermore, where different techniques yield conflicting advice, the literature provides little guidance on which to follow.

Our solution has been to present the 'textbook' advice relating to each technique, together with a discussion in the online help of the technique's strengths and weaknesses and the rationale for the advice, and a general 'health warning' that managerial judgement is needed in interpreting advice, which may not apply in all cases, but which should rather be regarded as a starting-point for debate. The advice is deliberately transparent, the system making it quite clear how the advice is arrived at (such as by examining which quadrant the product-market is in). The simpler 4-quadrant advice is used for the DPM, there being no obvious way in which the system can reliably determine where the box boundaries should lie in the 9-box version (even the 4-box form providing difficulties in determining boundaries). The user is left to reconcile differing guidance received from different techniques. The aim is to empower the user to make mature and subtle judgements, not to present a "black box" which advises the user how to proceed based on hidden algorithms or rules. In general, the emphasis in development has been less on the issue of advice than on other aspects of the support of the planning process that we have discussed, such as process support, data handling and presentation.

This approach is consistent with survey findings that showed that portfolio models:

> "tended to be used qualitatively, and that the experience curve thrust of the growth-share matrix was not a dominant part of the use of the models" (Aaker 1988)

and with Cronshaw et al's (1994) conclusion that:

> "The value of the 'stuck in the middle' suggestion...does not lie in its prescriptive content, but in its use as a framework for generating questions and thinking in a structured way about the strategy of a particular business".

An alternative approach to ours would be to attempt to overcome these weaknesses in available theory by improving upon textbook advice and integrating the advice arising from different techniques. The Business Insight system (McNeilly and Gessner 1993; Wilson and McDonald 1996) endeavours to do this. Apart from the argument that there may be little reason to suppose that the resulting advice would be any more valid than the user's own judgement, this approach, if achieved only with the loss of transparency of how the recommendations were arrived at, seems somewhat peripheral to the key benefit cited by many users of portfolio models of:

> "achieving a better understanding of their businesses...by providing a vocabulary and graphic tools that aid communication" (Aaker 1988).

The support from the system design evaluation for the adopted approach was mixed. Of the two companies requesting more advice, at least one seemed influenced by the "expert systems" label that was sometimes applied to the system - a label only used with some reservations and qualification by the authors. Nevertheless, these expectations led to the useful suggestion that the system could aid more with validating soft constraints between data items entered, such as pointing out the potential discrepancy where market share is low and strength in market is rated as high, or vice versa. With some caution, for the reasons we have discussed, this check was added to the full specification, along with a few others such as:

1. An increase in market share is in general unlikely to be achievable without an increase in relative strength in market. The user is warned if this is attempted.
2. If the user creates more than 15 product-markets, the system asks the user if they are sure they wish to deal with so many units of analysis, and encouraged to consider combining product-markets, omitting unimportant ones or performing planning at more than one level.
3. Where the price CSF is not automatically calculated by the system, but rather is assessed by the user, the system checks that the price CSF and the actual price figure move in the same direction. If, for example, the price CSF score increases between the Current and Objectives stages (indicating more competitive pricing), but the price figure is actually increased or left constant, the system shows a warning message suggesting that the user check whether this is correct.

None of these has yet been implemented, however, and caution is felt to be appropriate about introducing advice without clear evidence from live system use that it is needed.

Usability issues

The system design evaluation, as we have mentioned, provided clear feedback that the prototype system could be much easier to learn. We have discussed several respects in which this was addressed, notably under process support. A further change aimed at ease of learning concerned the switch from the proprietary windowing environment embedded in Smalltalk-80 to the de facto standard of Microsoft Windows.

Tailorability/extensibility

One design aim was to allow for modification of the system, either for subsequent generic development, or for company-specific tailoring. The theoretical advantages of object-oriented programming (OOP) environments include the relative ease of adapting a program once written, as well as managing development of complex systems (Meyer 1992; Coad and Yourdon 1990). These were factors in the use of OOP technology for the demonstrator and the prototype, and was a disadvantage of the development environment used for the MacroScope system. Visual Basic forms an intermediate stage which can be termed ‘object-based’ due to the absence of the inheritance concept, despite the presence of some other object-oriented features. It is so far responding well to the need for adaptation and refinement, though.

Group support

The point was made in the system design evaluation that more senior users may in fact not operate the system themselves, or may only take over actual system operation when much of the data is entered. One described the envisaged use by divisional general managers, who would in practice find a staff member to operate the system, and hold planning sessions either just with the operator, or in a group as if round a whiteboard. In this group situation, it was envisaged that the PC screen would be projected onto the wall. Subsequent experience has shown that this is indeed the typical mode of use. None of the companies requested the further group support of providing a multi-user version of the system, whereby a number of users at different terminals or personal computers could access the same information concurrently.

Each version of the system accordingly adopts the simplest approach of what is traditionally called a ‘single-user’ system, although in practice use with an overhead projector as described above, or simply use by a small group clustered around a single monitor, is common.

DISCUSSION AND IMPLICATIONS

Introduction

Figure 1 summarises the relationship between system 'features' and the aspects of planning that are affected by the features. We have summarised the design of a specific system, EXMAR. This represents just one of an indefinite number of possible designs, and we cannot claim any aspect of the design to be optimal. In this section, as well as summarising the broad feature/benefit relationships, we nevertheless endeavour to make some tentative, more specific recommendations to future developers. We structure the discussion according to the features in Figure 1. We will also refer to the benefit propositions listed in Table 5, which were generated and tested by the summative evaluation reported elsewhere (Wilson 1996).

[Take in Figure 1]

[Take in Table 5]

Data handling

The system's data handling facilities most obviously affect data management (benefit BE6). Prompting for data may affect awareness of data requirements. This may in turn affect data availability. The system's validation of data entry, and maintenance of constraints between numbers entered, can improve data accuracy. Data handling facilities may also save time (BE7), and can aid in group communication sessions through the facility to re-enter data items and rapidly see the response on dependent data items or graphical displays (BE2). Finally, data handling facilities can aid the use of marketing tools through reduced effort and improved quality of the inputs (BE1).

As we have seen, information entered once can be used in different analyses, reducing the effort involved and increasing the depth of analysis. This contrasts with some other systems we have reviewed, such as that described by Aitken and Bintley (1989), where multiple techniques, if supported, each draw on their own data inputs. Organising round a logical data model can also help the user to understand the tools and techniques, by making transparent their interrelationships.

Data presentation

Data presentation, whether in the form of graphical displays or retabulations of input data in a different format, may save time when this presentation is desired as part of the plan; and where the display corresponds to a 'marketing tool' such as a portfolio matrix, the data presentation assistance can reduce the effort required in the tool's use (benefits BE1, BE7). The presentation of the user's inputs in a standardised form such as a portfolio matrix, a product life cycle or gap analysis may also have a learning effect (BE10). Graphical presentations may aid with mutual understanding within a group (BE2).

The importance of data presentation in the support of marketing tools deserves some discussion. Users in the system design evaluation referred to the tools' role in confirming or modifying intuitions about some aspect of the organisation's market situation, and in communicating these insights within a group. This is a very different emphasis to the sometimes assumed primary role of such tools of prescribing or at least advising the appropriate action, Armstrong and Brodie (1994) for example critiquing the Boston matrix on this basis. Instead, we found that textbook advice was regarded as at best a suggestion to encourage thought and debate, and at worst a prescription which, if followed blindly, can leave those in receipt of plans open to manipulation. We would characterise the primary analytical role of judgemental tools as aiding a process of hypothesis consolidation, in which judgements of relevant managers, combined with any relevant external data, can be represented and synthesised in a commonly owned model. Hence, the judgemental tools are complementary to each other and to analyses of 'hard' data such as causal or econometric models, and are of particular relevance to situations where information is imperfect, rather than being competitors to financial or other models as implied by Armstrong and Brodie. Given their role in group communication, then, their graphical presentation is particularly important.

This view of marketing tools has resonances in the literature on strategy formulation in teams. Bowman (1991) wrote of "surfacing managers' perceptions", using scales to measure the organisation's perceived cost leadership and differentiation, and reflecting the resulting measures graphically back to the participants as an intervention in their strategy debate. These perceptions varied - in some respects systematically, for example varying by function (Bowman and Daniels 1995). Decisions could nevertheless emerge from a management team despite the persistence of some differences in perceptions - a finding echoed within group psychology by Moscovici and Zavalloni (1969) and Langfield-Smith (1992). Differences were also found in managerial perceptions of their competitive environment assessed using cognitive maps by Daniels, Johnson and Chernatony (1994). These authors concluded that:

> "a team of managers is able to debate strategy based upon mutual recognition and understanding of each others' mental models, rather than cognitive similarity"

- cognitive similarity relating here to the extent to which the managers shared:

> "similar, if not the same, conceptions about whom the competition is, and the strategies that these competitors are following".

In these terms, we can rephrase the role of some analytical tools as being to assist the participants' "mutual recognition and understanding of each others' mental models".

The resulting emphasis on graphical display of the users' inputs as a communication device is consistent with the experimental finding that graphical display can impact decision-making positively (Benbasat and Dexter 1986; Jarvenpaa 1989), suggesting that if the effort involved in generating the displays is reduced, it can render marketing tools more usable.

Data interpretation: advice

Data interpretation assistance in the form of advice can help with the interpretation of marketing tools (BE1), and can also have a learning effect (BE10).

In accordance with the above discussion about the importance of data presentation and the role of marketing tools, advice has not formed a major component of any of the EXMAR versions. This may lead to the question to what extent the 'expert systems' label is appropriate for EXMAR. The original aims of the EXMAR research club which sponsored the early work were to apply expert systems to marketing planning. However, the authors' analysis approach was consciously open-minded, modelling the available expertise with whatever representations proved most appropriate, starting with the most well-established and verified expertise, which concerned marketing tool inputs and their place within a process, rather than reliable rules on their interpretation and implications for action, which were conspicuous by their absence. In particular, it did not seem relevant to use the rule-based representations sometimes defined as the essence of expert systems. We have also seen that the 'expert systems' term raised some specific and counterproductive expectations for some users.

All aspects of the EXMAR system can, though, reasonably be said to be based on expertise, including the process, the data model, the means of presentation of information, the checklists and help provided and the few cases where advice is given - though it can been argued that (say) a payroll system incorporates expertise similarly. Regarded as an expert system, then, the system thus takes the "low road" according to Brown's (1984) categorisation of expert systems discussed earlier, in that expertise is embedded in data structures and procedures, rather than being present as an explicit representation such as that contained in rule-based systems. There is certainly much available (but not necessarily formalisable) expertise that has not been captured. A critical design task has been the effective definition of the boundary between the system and the user such that the user is encouraged to think about the issues that the system cannot of itself address.

This co-operative style of software support, involving a humbler role for the computer than the ambitious aims of some expert systems, is consistent with the distinction discussed by Charles Handy (1989 p118) between ‘automating’ and ‘informating’:

> Automating tends to concentrate on the smart machine and to cut out or reduce people. Informating organizations also use smart machines but in interaction with smart people...Informating wins in the longer term because the organization’s thinking or ‘intellective’ capacity has been increased.”

The boundary between a "low road" expert system and a decision support system is difficult to draw. The EXMAR system can perhaps best be described as an "expert support system" in Luconi et al’s (1986) categorisation, given the shared responsibility between system and user for the decision process, which we now turn to.

Process support

Support for a planning process can help to structure planning meetings (BE2). It may also help to select an appropriate tool for the relevant stage of the process (BE9). As with other aspects of the system, it may have a learning impact by example, and through the convenient availability of ‘textbook’ guidance relevant to the step being performed (BE10).

We have seen, though, that it is important that the system’s process support should guide rather than dictate. The divergences in processes that may legitimately be followed when first developing a plan, the necessity of iteration and the concept of continuous planning (BE3) imply maximum flexibility in the ordering of tasks, including the facility for any part of the system to be revisited at any point.

This issue of the regularity and frequency of planning is one respect in which marketing planning as observed in our evaluation differs from much prescriptive theory. Some companies aim (with the aid of software in our study) to maintain a live marketing model of the business, from which snapshots are taken if and when required for formal presentation and review. In others, the reality is one of ‘ad-hoc’ strategy formulation exercises carried out for particular purposes, with no plan revision necessarily scheduled for the following year. These observations confirm that planning theory, and therefore planning systems, that assume an annual cycle may be neither realistic nor ideal. Although marketing literature has long referred to continually updated marketing audits (McDonald 1995), our point goes beyond this towards a change in the conception of marketing planning to “a continuous rolling process which is a central part of managing the business” (Piercy and Giles 1989), contrary to the emphasis of some on the plan itself (Abell and Hammond 1979). More echoes are to be found in literature not specifically dealing with marketing, for example in the theme of different styles of strategy formation (Anderson 1983; Pinfield 1986; Bailey and Johnson 1994), and related calls for continuous planning (Morgan and Piercy 1993).

Related to this variety in styles of planning is variety in the sequencing of planning tasks. Piercy and Giles' (1989) argument for "starting at the 'end' with tactical implementation issues and working back to the 'beginning' of strategies and missions" has parallels in the domain-independent DSS work of Eden (1989), whose influential "Strategic options development and analysis" (SODA) approach allows either or both of two modes of working to be used: "working with the client on an analysis of the goal system and then down the model towards options, or working from options towards goals". It also has echoes in Anderson's (1983) analysis of US decision-making in the Cuban missile crisis, in which "the act of making decisions led to the discovery of goals".

We would therefore support the decision calculus school (Little 1970) in the belief that the user should be left in control of decisions, including decisions about the process followed. This implies a free interface, following the edict of the developers of the seminal Xerox Star interface: "Never pre-empt the user" (Bewley et al 1983). Some users nevertheless appreciate the support gained from being guided through a typical process. This guidance is different in nature on the one hand from the support for rigorous clerical processes traditionally addressed by transaction processing systems, and on the other from the totally free interface of a word processing package or a spreadsheet. In the development of EXMAR, the approach to this has taken some time to evolve: the demonstrator seemed too close to the former, the prototype to the latter, the later versions we hope about right.

CONCLUSIONS

Mintzberg showed long ago that management is not the idealised decision-making process of Management Science. A Martian reading the average textbook might assume that on the way to work, every marketing manager says: "Today I have to sit down in my office and analyse a pile of data, generate some alternatives, evaluate them & select an optimal decision". But the reality of tasks such as marketing planning is as much about sharing experience and perceptions in the absence of hard data, communicating ideas, selling proposed solutions, negotiating, dealing with political constraints, counteracting fears, building commitment and, of course, simultaneously juggling implementation issues.

IT support needs to reflect this messy reality. It is no coincidence that while researchers were at the height of their expert systems craze in the late 1980s, practitioners were quietly adopting the humble but flexible generic tools of office automation - the communication aids of word processing and presentation packages, the ad-hoc analysis tool of the spreadsheet, and increasingly the communication medium of email. And yet practitioners still desire some overarching structures to guide them through complex, ever-adapting tasks such as marketing planning. Gorry and Scott Morton (1971) were right, such tasks are semi-structured. Their IT support hence needs a balance between the lack of structure of office automation tools and the tautly constrained structure shown by traditional management science models, most expert systems and the plethora of numerically-based decision aids emanating from business schools. IT support also needs to recognise that managers work together not alone. This paper has described one tortuous but rewarding journey along the resulting tightrope.

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Table 1: System scope defined by planning process

	Demonstrator	Prototype	Full specification	MacroScope system	Visual Basic system
Mission/ corporate objectives	Prompted for as an input (with online help)	As demonstrator	As demonstrator	As demonstrator	As demonstrator
Situation analysis	System prompts for current revenue/market size & SWOT data, produces graphics/advice	As demonstrator but fewer analyses	As demonstrator plus historical data, more analyses	As full specification but not all analyses implemented	As full specification
Forecasting	Financials only entered for start & end of planning period. Forecasts provided by user	As demonstrator	Yearly financials entered by user, with option of extrapolation	Yearly financials entered by user	Yearly financials entered by user
Marketing objectives	In terms of volume/value/share; others in words	As demonstrator	Also in terms of profit /contribution	As prototype	As full specification
Marketing strategies	Free text; up to the user to relate to marketing objectives & CSF changes	As demonstrator	Prompted for when CSF scores are changed	Same but costs informal	As MacroScope system
Action programmes	No	Document under broad headings	As prototype	None	As prototype
Plan documentation	None except printing out screens	Template plan provided; electronic cut & paste needed	Automatic generation of default plan document	None except printing out screens	Automatic generation of default plan document
Monitoring	No explicit facilities, though a plan may be copied & updated	As demonstrator	As demonstrator	As demonstrator	As demonstrator

Table 2: System scope in terms of techniques

	Demonstrator	Prototype	Full specification	MacroScope system	Visual Basic system
Ansoff matrix	Yes but not graphical representation	As demonstrator	Yes. Existing/ new info used in gap analysis	As full specification	As full specification
Gap analysis	Limited (bar chart)	As demonstrator	Yes, by revenue/profit	Yes, by revenue only	As full specification
Product life cycle	Drawn by system, interpreted by user	No	Drawn by system, interpretated by user	As full specification	As full specification
SWOT/CSFs	Yes, words and quantified CSFs	As demonstrator	Yes: also stacked bar chart of CSFs	As full specification	As full specification
Competitor analysis	Only in form of CSF scores for main competitor	Same plus free text	CSF scores for each, plus structured text	As full specification	As full specification
Market attractiveness	Quantified MAF analysis	As demonstrator + advice to avoid clustering	As prototype + stacked bar chart of MAFs	As demonstrator	As full specification
Perceptual map	No	No	Yes (one CSF vs another only)	No	As full specification
BCG matrix	Yes	No	Yes	No	Yes
DPM	Yes	Yes	Yes	Yes	Yes
Cost/different-iation matrix	Yes	No	Yes	No	Yes

Table 3: Nature of system support

	Demonstrator	**Prototype**	**Full specification**	**MacroScope system**	**Visual Basic system**
Process support Navigation	Process tree	'Action panel' (organised round data)	Process tree/menus + 'next screen'	Process tree/menus	Menus + outline tool
Status feedback	None	Status display	Combined with process tree	Combined with process tree	None
Help	Specific steps only	Per step in process	Per step: also obtainable from forms	Per step: also obtainable from forms	Per step: also obtainable from forms
Data handling Prompting Validation Calculations Constraint maintenance	On data entry forms, with checklists & other guidance in help. Forms inconsistent	Numbers entered on forms; words largely in template plan. Field validation	Forms relate more directly to steps of process, and include words & numbers	As full specification. 'Post-it' facility for adding notes to numbers	As full specification. Facility for adding notes to numbers
Data presentation Tabulations Graphics	Hard-coded facilities	Main graphics hardcoded, others definable by user	Windows & spreadsheet link allow user to add to standard facilities	Hard-coded facilities	Windows allowing user to add to standard facilities
Data interpretation Advice	4-quadrant advice for BCG, DPM; portfolio balance advice for DPM	DPM only. Also process advice: MAFs. Portfolio balance statistics	Also advice derived from Porter matrix	4-quadrant advice for DPM only; PLC advice in help	As full specification
Usability issues	Forms inconsistent.	Forms consistent. Windows awkward	Microsoft Windows for standardisation.	High consistency but poor windowing	As full specification
Tailorability/ extensibility	Developed with object-oriented language (OOP)	Developed with OOP.	OOP. Various system options. Windows links	Not OOP. Various system options.	Various system options. Windows links. Visual Basic 'object-based'
Group support	None	None but typically used with projector	As prototype	As prototype	As prototype

Table 4: Summary of criticisms of prototype from system design evaluation

Area	Summary of comments from participating companies
Process support	The disjunction between the 'action panel' (organised round data) and the 'guidance browser' (organised round the process) caused much confusion at first. One solution proposed was to organise the interface round the task overview tree (as had been the case in the demonstrator). See also 'usability issues'.
Data handling	Various extensions were requested to the basic financial information covering revenue, volume, price, market size and share. This needed to be enterable yearly throughout the planning period, and for the previous few years; and four companies wished to incorporate a simple cost/profit model. An important feature of the system was the power to associate text with numeric data. This could be easier to achieve, particularly for the market attractiveness factors and critical success factors, and when setting objectives and strategies.
Data presentation	A number of enhancements to the DPM and the qualitative analyses behind it were requested, including extended facilities for competitive analysis. Additional tools that were identified as potentially adding value were the Boston and Porter matrices; product life cycle and forecasting; perceptual maps; and market maps. At the end of the planning process, a marketing plan document should be assembled by the system from the information entered, for the user to take and adapt as required. Ideally this should be in a standard word processing package.
Data interpretation	There were differing views on the limited, 4-quadrant advice from the DPM. Two companies compared it with their expert system expectations, questioning whether the prototype "qualifies as a knowledge-based product", and asking for more fine-grained advice. But one felt that more subtle advice, even if achievable, would be ignored as it would have little chance of being correct given the limited information available to the system, while another suggested that the current 4-quadrant generalisations "only devalue all the useful and productive thinking that has occurred during the evaluation stages, and trivialise the lessons of marketing planning", and should be removed. Some additional consistency checks proposed, e.g. for the system to point out if 'strength in market' is high and market share is low, or vice versa, encouraging the user to review this potentially conflicting information.
Usability issues	The prototype needed to be easier to use and, critically, easier to learn. Users may not have extensive IT experience, and would have limited time available to learn the system. This implied a style that 'guides the user by the hand'. At present the system provided "a great deal of flexibility which is good for the experienced user", but could be "very overwhelming" for the novice. Objective and strategy setting needed particular attention. Some criticisms made of documentation and the ease of printing.
Tailorability/ extensibility	Four companies requested links to standard spreadsheets. One reason was to handle any cost details not included in EXMAR. One company mentioned importing text from word processors: another mentioned the desirability of interfacing to graphics packages. The two financial services companies thought they would need to tailor the definition of 'revenue', as 'price x volume' was an inadequate definition for them.
Group support	No requests for a multi-user version. Use was anticipated round a single monitor, very probably projected onto a wall screen.

Table 5: Benefits generated & tested by summative evaluation

Hypothesised benefit	**Description**	**EXMAR**	**Other systems**
BE1 Aid use of marketing tools through calculations, graphical display, guidance on use	Marketing tools can be more easily used with appropriate system support, due to calculations and graphical display, reuse of data between techniques, and guidance on their application. Hence in limited time, tools are more likely to be used. This can update the users' intuition on their markets and their place within them.	Supported	Supported
BE2 Support group planning, resulting in focused debate, improved mutual understanding, more equal participation &greater consensus	DSS support for fast iteration facilitates collaborative workshops. Incorporation of a planning process provides a readily agreed agenda. These can result in better focused discussions, better mutual understanding and greater consensus about the strategies that emerge. The system can depersonalise disagreements, leading to more equal participation.	Supported	Supported
BE3 Enable live marketing model	The system can form the repository for "live" electronic plans, updated periodically, from which annual snapshots are taken for formal presentation.	Little evidence	Supported
BE4 Ease integration of functional perspectives	The electronic medium can facilitate the integration of the marketing plan with analyses from different functional perspectives to form a convenient and internally consistent aid to strategy debates.	Little evidence	Supported
BE5 Help to manage complexity of multiple-level plans	The system can help to manage the complexity of planning at more than one organisational level by ensuring consistency in planning, aiding comparison across SBUs; allowing a shared representation of the hierarchy of product-markets; and aggregating data from several SBUs to form the basis of a higher-level plan.	Not supported	Supported
BE6 Aid identification of data requirements, improving accuracy & availability	Systems can assist with identification of critical data requirements. This can help target market research and specify marketing information systems, as well as clarifying assumptions where data is absent. In time this can lead to better availability of accurate data.	Limited support	Limited support
BE7 Save time compared with equivalent paper planning,particularly on revisions	A time investment in learning systems is needed, unless a facilitator is used. Once this has been made, systems can save time compared with equivalent paper planning, due particularly to calculations and graphical display, especially when revising existing plans.	Limited support	Limited support
BE8 Improve plan credibility & confidence	The resulting plan is more credible than it would otherwise be, and its authors have more confidence in it.	Limited support	Limited support
BE9 Improve support for planning process	The system can provide a consistent, logical process to follow, of particular value to users inexperienced in marketing planning. Navigation facilities, status feedback and online help can result in better process support than equivalent paper-based systems.	Mixed support	Mixed support
BE10 Aid learning about marketing planning	Through planning with the system, users learn to apply the process and techniques it includes, knowledge they can apply in future planning, whether DSS-aided or not.	Limited support	Mixed support
BE11 Increase planning confidence and enthusiasm	For many managers, the learning effect of systems adds to their confidence in their marketing planning skills, and their enthusiasm for marketing strategy activities.	Mixed support	Limited support

Figure 1: Major relationships between features and process/learning variables