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THE STRUCTURE AND CONTENT OF THE MARKETING INFORMATION SYSTEM: A GUIDE FOR MANAGEMENT

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Introduction

Marketing Intelligence Systems have been the focus of academics and businessmen for over 20 years. While they are seen as offering numerous advantages to firms, their adoption has tended to be slow and accompanied by stories of unfulfilled promises and unexpected dysfunctional consequences. It has been suggested that this has been due to a number of reasons, some technical, some organisational and some psychological. These problems frequently related to an inadequate analysis of the nature of the need that Marketing Information Systems (MkIS) was meant to satisfy, and researchers therefore were encouraged to consider the nature of the decision making over different business functions, levels of authority and time spans, in an attempt to match system and user correctly. This frequently identified a hierarchy of decisions which thus required a matching hierarchy of specifically designed information systems.

Despite our increased understanding of the need to match the information system to the user, rather than force the user to fit the system, problems still arise, particularly in marketing, when databases or programs designed for another use or function are transferred to marketing problems. This is particularly the case for spreadsheets, etc, initially designed for accounting purposes. However, with the advent of integrated systems such as "Symphony", the added flexibility of being able to combine spreadsheets, database, graphics, word processing and communcations increasingly satisfies the requirements of the marketing manager. It remains to be seen how successful these integrated systems will become.

In this article, we briefly review the nature of the marketers' information needs and how this relates to a taxonomy of systems. We then show how a MkIS should be considered as a subset, or module, of the total Management Information System (MIS) and give guidance for the development of such a system. Three case studies are included to highlight the main issues raised.

Information and Marketing

The growth of information technology (IT), and information systems in particular, is of particular importance to the field of marketing. In 1982, when referring to the market research industry, Hyet emphasised this importance when he said: "The industry's *raison d'etre* is information — information discovery, information collection, information dissemination and, hopefully, information use."

In marketing planning, this information use is seen at its most obvious. The types of decisions made in marketing require constant scanning of the environment to recognise opportunities and threats, and a corresponding analysis of the firm to identify its strengths and weaknesses. IT, by improving the efficiency of this information usage, should, in theory, also improve the efficiency and effectiveness of decision making in marketing planning.

The emphasis here is on the *efficiency* of information usage. Management has historically had an over-abundance of information, but typically of the wrong sort, arriving too late or buried amongst a mass of irrelevant data (Ackoff, 1967). An information system which increases the amount of information at the manager's disposal without contributing to an increase in the manager's understanding or knowledge is thus inadequate. While managers require information so as to be kept informed, they also need it to reduce the uncertainty and risk involved in strategic or planning decisions. Strategic decision making is, however, only a small part of most managers' roles. Mintzberg (1973) identifies ten roles that are inherent in the manager's job, which can be classified as interpersonal (figure-head, leader, liaison), informational (monitor, dissemina-tor, spokesperson) and decisional (entrepreneur, disturbance handler, resource allocator, negotiator).

Not surprisingly, a wide range of informational inputs are used in the execution of these roles and the value and use of the computerised information inputs will be dependent on the value the executives assign to the information used while performing these roles. A recent
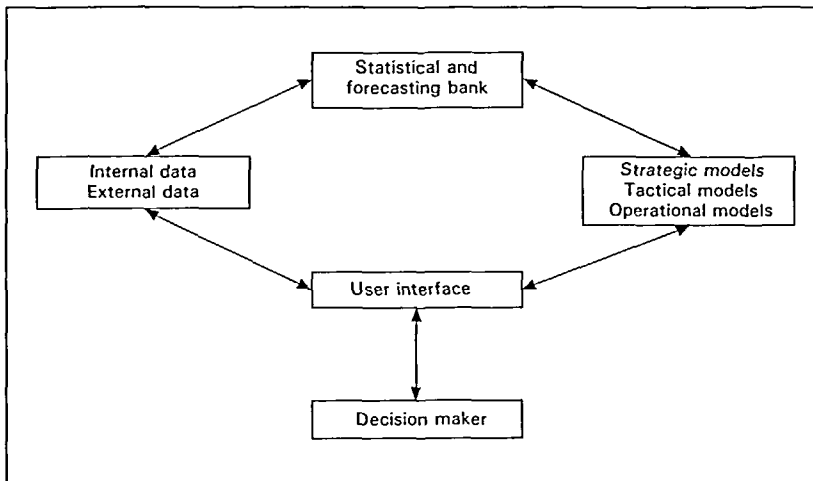
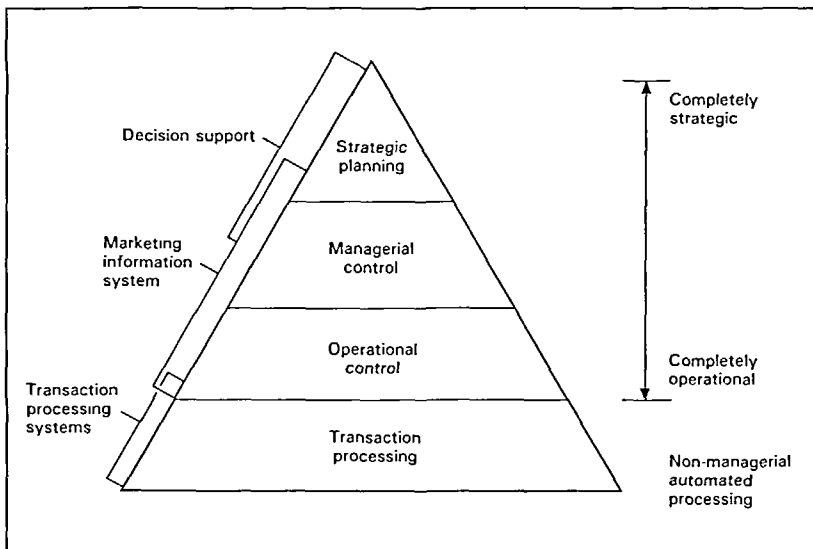*Figure 1.*
Elements of a Sophisticated Information System

Figure 2.
Computer Systems for Consumer Marketing Activities

management and adoption should be proceeding at a fast pace. This has not been the case, however, with management, particularly in the UK, not being over-enthusiastic in its acceptance of MIS (Jobber, 1977; Fletcher, 1983). While approximately 50 per cent of firms surveyed claimed to have a MIS, these were generally of a low sophistication. Fletcher's 1981 study found that the majority of systems involved basic sales data only, with others only capable of limited profitability analysis. One-third of the systems could not supply information on the environment — an essential element of marketing analysis.

As stated earlier, this reluctance of marketers to use information systems has been due to the nature of marketing decisions, the type of information required for these decisions, as well as the lack of sophistication of the information systems themselves.

Sprague and Watson (1979) suggested that a continuum exists of Electronic Data Processing systems at one end and Decision Support Systems (DSS) at the other. An EDP system would have a basic data processing function, e.g. order keeping, pay roll, etc, with no common database. It could classify, sort, add, delete and update information and thus act as an electronic filing cabinet. Next comes an integrated data processing system with common database, followed by an MIS which has the ability to analyse data and run simple modelling, and finally DSS. DSS they view as an integrated information system composed of the decision maker, decision models and database to support decision making, as shown in Figure 1.

The main difference between the terms is in the degree of *sophistication of the system and its decision-making* ability compared with its information analysis or retrieval ability.

The lower-level EDP systems are useful at the level of operational control when highly accurate, detailed data are frequently used in the preparation of invoices, etc, and the information tends to be quantitative, current and internal. Keen and Morton (1978) compare this with the information requirements at the strategic planning level where the focus is on the future, information is generalised rather than detailed, external in focus and qualitative. Goodyear (1986) and Goslar and Brown (1986) similarly emphasise how the taxonomy of information systems tend to match the levels of business activities with the early simple EDP systems being suitable at the operational level, but DSS systems being required for planning purposes (see Figure 2).

This classic management triangle was first proposed by Anthony (1965) and has been widely used by theorists.

It is with the development of decision support systems (DSS) that computerised information systems have begun to offer marketers the same benefits that other departments have already acquired. DSS can cope with the unstructured, qualitative, what if, type questions that characterise marketing decision making. They will do more than simply retrieve and manipulate data, additionally allowing for the application of realistic decision rules to market simulations, thus becoming almost partners in decision making (thus the term Decision Support Systems). The DSS allows direct interaction between the decision maker and the information base, with a flexible user-friendly interface between user and system which accepts the ill-structured future-orientated problems. The marketers

study of five top executives suggested computer reports were less than three per cent of their informational inputs, with a greater preference being given to oral communications, and brief memos and letters. Informal systems were also preferred over formal systems, and when computer reports were used, they were frequently rewritten into "non-computer" form (McLeod and Jones, 1986).

The analysis of the major duties, or roles, of a marketing manager would thus seem to be an essential prerequisite to designing a MkIS. Two managers, such as a marketer and an accountant, might wish to use the same software package, but access different information for different purposes, or, conversely, use the same information in different packages. Unless this overlap is identified, the organisation might experience expensive duplication of resources, conflict between managers who perceived the other as poaching on their area, or in some cases the misuse of data because of definitional or classification differences.

The Computer and Information Flows

If the use of information is an essential element in fulfilling managers' roles, and computers are a way of effectively and efficiently handling information, then a computerised information system should be a boon to

can then apply their own idiosyncratic heuristic decision rules that reflect their approach to solving a problem. Two recent developments that are likely to lead to a much faster and more widespread adoption of computerised systems are, firstly, the development of personal computers allied with the availability of sophisticated software programmes suitable for marketing, and, secondly, expert systems.

Expert systems are a development from artificial intelligence, and can be used "to preserve and disseminate scarce expertise by encoding the relevant experience of an expert and making this expertise available as a resource to the less experienced person" (Luconi, Malone and Scott Morton, 1986). It focuses on the decision-making procedures used by people and creates programs that replicate this reasoning. As such, it satisfies rather than optimises, uses simplifying heuristics, accepts symbolic and qualitative data and generally acts more like a human expert than a computer. This expands the areas, or problem types, that can be appropriately computerised. When no standard operating procedure exists, "when goals and constraints are only partially understood. . ., then computers can only perform the well understood parts of the problem solving, while at the same time humans use their goals, intuition and general knowledge to formulate problems, modify and control the problem solving and interpret the results" (Luconi, Malone and Scott Morton, 1986). The use of spreadsheets and "what if" analysis can be seen to fit this process where the selection of alternative strategies and judgement of the consequences is the function of the manager, the computer merely predicting the consequences.

Expert systems use programming techniques to encode the same sort of decision processes of problem definition and evaluation used by people in solving problems, a task which has previously been very difficult to achieve. This capitalises on scarce resources (experts), while allowing their logic and experience to be available and understood by less expert members of the organisation. Luconi *et al.* predict that it is likely to be the 1990s before expert systems are accepted as having proven their applicability to business situations, and by then personal computers should be in the majority of marketing departments.

Personal computers (PCs) have had a major sales growth in recent years. It is difficult to define PCs either by price or size as both are reducing year by year. Their main features are relatively low price, under £2,000, and compact and user-friendly, which allow them it to be operated by a non-computer specialist. This is to be contrasted with the "impersonal" mainframe, which is operated by a data-processing department. This, however, is potentially misleading, as a carefully chosen PC should be compatible with the existing mainframe, and recent mainframe software, such as Thorn EMI's FCS-Multi, can be accessed by personal terminals and is extremely user-friendly.

Some manufacturers have tended to develop a hierarchical system which sometimes makes integration of PCs with mainframe difficult, even when from the same manufacturer. DEC's philosophy has been to develop hardware throughout its range, which is capable of being networked, an additional piece of equipment often announcing its own arrival to the network, and thus easily integrated into the system of PCs and mainframe.

It is PCs, however, which have captured the attention of managers. This is partly due to the personal, private aspect of PC usage. The manager's stumbling attempts to understand the system, or the problem, are not exposed to critical external attention. The manager can proceed at his/her own pace, gaining knowledge and expertise with practice. The continual reduction in price of PCs, coupled with the low initial preparation and set-up time, together with the range of operating environments it can function in, also means that the order of a PC does not attract undue attention on financial grounds.

This, however, is also one of the reasons likely to lead to later dissatisfaction with the purchase. Careful analysis of needs should initially focus on the use the PC will be put to, and the software best suited to achieve this. Recent surveys of marketers' potential use of PCs (Weiner, 1984; Berry, 1983) found managers focused on the database element of software, i.e. sales recording, from which forecasts, comparisons and quotas can be developed, or development of customer profiles. It thus capitalises on the ability of PCs to collect, organise, retrieve and process much faster than traditional file storage methods. Word processing is also a common usage of PCs, but one which turns the machine into a glorified typewriter, and the executive into a typist. However, the potential to interface with desk-top publishing systems to produce high-quality fact sheets and presentations clearly enhances its potential for direct use in marketing.

The main benefits of PCs come not from the previous two sets of applications, which can be done on quite simple and cheap systems, but on the data manipulation, processing capabilities and the use of more sophisticated software, such as D Base II and III, Multiplan, Lotus 123, etc. The problems that are likely to arise when the marketer starts to use the PC to its full potential are typical of those met when developing mainframe-based information systems, and will therefore be discussed further.

Firstly, the *ad hoc* purchase of a system may initially satisfy immediate requirements, but the memory or processing capacity may not be adequate for future problems.

Secondly, incompatibility will almost certainly become a problem using this *ad hoc* approach. Incompatibility with other PCs in the organisation, incompatibility with other software, and incompatibility with the mainframe. This results in expensive duplication of packages, and means a network of PCs cannot be built allowing for transfer of messages and data. Incompatibility with the mainframe means all data must be re-entered into the PC (by the manager?) instead of simply being downloaded, and the results of his/her processing cannot easily be transferred back. This puts additional strain on the PC's memory capacity.

The learning curve which comes from experience is also likely to be reduced. If a network of similar machines exists, common problems can easily be solved and experiences shared. A one-off purchase means the manager is on his/her own, and with the cheaper machines bought direct from computer shops, the technical service back-up will frequently not be there to help him/her solve the many problems a beginner meets.

PCs can easily become time sinks of expensive executive time. Many enthusiasts will testify to the addictive nature of PC usage. An initial investment in time is needed to understand the basic system; further time will be needed

to become adept in its use. Once this stage has been reached, the individual frequently wishes to move into computer graphics for better presentation of the data, more esoteric applications are devised, and finally real addicts start designing their own programs (Freeland, 1983).

The final problem arising from PC purchase is obsolescence. With the constant upgrading of equipment and software, the temptation is to wait until the market stabilises. The Sinclair QL set new standards when introduced, but was soon matched. The Amstrad similarly made a quantum leap, forcing other manufacturers to react by price cutting and their own innovations. The IBM PC has become almost the industry standard, but many clones exist that are better buys than the original, forcing IBM to introduce its new System 2 Micro in April 1987. This has a new operating system that allows versions of software from old systems to run on the System 2, but not System 2 software to run on the older systems. Its new features are the design for multi-users, about 16 MB of RAM, over 240 MB of storage capacity, and speed of operation. Similar developments exist with software — Visicalc was followed by Multiplan, Multiplan by Lotus 123, Lotus 123 by Symphony. Each development is an improvement on what has gone before, but frequently demands improvements to, or new, equipment. Managers are faced with the choice of committing themselves at an early stage, accepting the uncertainty and risk involved with this, but gaining the benefits of the new equipment, or waiting until clear standards and industry leaders emerge. By this time, their less timid competitors might well have gained a competitive edge by a better understanding of their market and more effective marketing responses.

The situation for marketers is now becoming clear. Information systems have developed beyond the simple analyses and retrieval of accounting and sales data, and modern software and equipment places them firmly within the realm of the marketing department. Marketers can hesitate no longer in making the commitment to a MkIS, and the problem becomes one of how best to proceed in developing their own *Marketing* Information System.

Introduction to the Design of a Marketing Information System

It follows from our previous discussion that it is unlikely that one global MIS will be suitable for all functional departments within the organisation. The differing information needs and management roles at different levels of the organisation require a sub-system, or module approach, to MkIS design. According to Pokempner (1975):

> General enchantment with the possibility of achieving total, global MIS has given way to pragmatic acceptance of the long, hard road to anything resembling its realization... Certainly the practical difficulties of integrating the information needs of heterogeneous business functions, for example, let alone the hints of theoretical flaws in the concept, have succeeded in shifting the aim of managers and systems specialists from the total MIS objective to the so-called sub-systems underlying the global mission. These sub-systems are the information systems serving the needs of key managers in such functional areas as finance, production, distribution, marketing, personnel, and research development.

Even if one sets out with the simplest of intentions in MkIS design, it is paramount to set long-term objectives

reflecting the ultimate scope and size of the system. Short-term objectives are also required and include such essential considerations as:

- What characteristics should a good information system have?
- Who should be involved in designing and implementing the system?
- How does one keep the Marketing Department interested in the development of the system?
- How sophisticated should the initial system be?
- What is required to move towards the longer-term objectives of producing a DSS?

An additional prerequisite is the recognition of the detail and the structure it shares with other sub-systems in the larger MIS. Therefore the question of structure of the MkIS would be developed in terms of the overall structure of a MIS, the content of the marketing sub-system within this model, the opportunities of integrating marketing with other sub-systems, and the benefits from developing the basic MkIS into a DSS.

Long-term and Short-term Objectives

Long-term

In the long term, a firm may aim for a DSS, but it is important overtly to state this objective, if that is what is intended, as it is germane to selecting computer hardware and software. For example, the development of a DSS presupposes the availability of communications hardware and software capable of interaction with external databases. In the same vein, if an organisation would require the setting-up of customer and/or competitor profiles, then the appropriate database must be available with sufficient storage capacity existing, or the machine must be capable of enhancement. The questions of growth and flexibility of the system are clearly important issues here, and, as stated earlier, too often one hears of poor choice of hardware and software limiting the future development of computer-based information systems.

Short-term

In the case of short-term objectives, the systems planners are interested in developing the most pertinent framework. Initially, the designers of systems should concern themselves with asking marketing managers to clarify their objectives, rather than asking them to specify information needs. Boyd and Britt (1975) state:

> It is too easy to say that improvement will come only when management specifies what kind of information is needed. That is not the case. Instead, the answer is that the researcher and decision makers must strive to interact in such a way as to make explicit the use to which research information will be put. This interaction can best be accomplished through (1) setting objectives, (2) developing the plans to achieve these objectives, (3) controlling and reappraising the program that has been carried out in order to determine whether or not the objectives, the plans, and the organisation are functioning properly.

It follows, from a marketing point of view that the setting of objectives cannot be accomplished with any high possibility of success until information is available about consumers and their requirements, alternative products and services that may substitute for the firm's offering and how this demand is structured in terms of market segments and the ability of the firm to capture the

chosen market segments making full use of their marketing and product strengths.

The important conclusions about the objectives of a MkIS are therefore as follows:

(1) that the ultimate size and scope of the system is anticipated;

(2) that the marketing function is developed sufficiently for managers to be able to state their marketing objectives;

(3) that the structure and content of the MkIS will be geared towards satisfying marketing management needs, and

(4) that the process of clarifying objectives and identifying the concomitant information needs requires the close co-operation of systems designers and marketing management.

Who Should Develop the MkIS

The system designer and marketing manager share the role of developing the system. The case for using the system designer is clear, as he/she is an expert in analysing existing systems and developing new ones. The role of marketing management is a little more blurred, because there are many echelons of marketing management. In this respect, we may look for inputs at various levels.

At senior marketing management level, the marketing director could be responsible for identifying which individuals or sections under his/her direction will be given priority in the initial stages of systems development. Middle managers will need to specify their marketing objectives and responsibilities, and it may then be the task of junior managers to examine what detailed marketing information is required to move towards achieving these objectives.

The system designer will need to communicate with all levels of the marketing management hierarchy when developing the system, and the final proposal will ideally satisfy all the various echelons of marketing management.

Motivating Staff

The question of staff motivation within the marketing department is of paramount importance. At all levels, staff need to be kept interested throughout the project life, from development through to the implementation phase. The work of Enid Mumford (1979) shed light on issues of motivating individuals and groups of workers by involving them in the design process, and Easton (1982) studied the impact of technology on the organisation. The important points that emerge from these studies are that the smooth introduction of MkIS may be impaired if the needs of individuals and groups within the department are ignored, or if the aspect of changing the technological base for information gathering and analysis is not treated properly.

How Sophisticated Should the System Be?

Naturally, every firm would like a most efficient MkIS which is capable of being enhanced into a DSS, but it is not realistic — or necessary — to expect this in the short term.

Diggory (1971) states:

In designing management information systems, it is suggested that the main concern should be with the information needs of those who function partly or wholly at the middle management level. Top level management, dealing with strategic considerations, is largely judgemental, based on a sparsity of information derived from special studies. Operating management dealing with day-to-day conditions is largely influenced by fairly well-defined factual data flowing on a continuous basis.

This sole focus on middle management is possibly overstated, and a more balanced approach would be to recognise the interrelationships between the levels. The main initial challenge is in providing an efficient information system for middle management who are concerned with short-term planning and control, and whose time scale in decision making is much shorter than that typically associated with long-term strategic decision making, and where scope is confined to using current resources to the best advantage. Operating management needs well-defined factual information, which is relatively simple to build into a computer system, if indeed it does not already exist. In the planning and design stage, it does not require a great deal of effort to satisfy the needs of operational managers, but the potential rewards brought about by better control are gratifying.

The requirements of strategic management will in part be met by information generated within the system for middle management, this data being supplemented by ad hoc and often qualitative information collected from the environment of the firm. Put another way, we would look for a speedy introduction of information for operating management, but a concentration on improving tactical decision making, and an ultimate, but not immediate, concern with formally incorporating information for the whole range of strategic decision making.

Specifically in the case of the initial MkIS, we would argue that one should be collecting information for short-term forecasting, modelling, planning and controlling the areas which together make up the marketing mix, i.e. pricing, product performance, promotion, distribution and sales force management. This inevitably will require information about both one's own internal marketing effort, in each of these areas, together with relevant primary or secondary data obtained from the task environment of the firm. This will cover such things as:

(1) setting short-term objectives in each area of the marketing mix;

(2) measuring performance by comparison with objectives;

(3) forecasting in areas to which the organisation is currently committed, and

(4) modelling the behaviour of existing markets and segments.

Requirements of DSS

In the longer term, the firm may wish to graduate to a full DSS, which involves the storage and retrieval of information that is often qualitative in nature. In fact, this kind of activity has been undertaken by researchers for many hundreds of years. Basically, one identifies the source of information that may, for example, be a journal article, and then in order not to forget it, one produces a card index system that is used subsequently to spot articles that have something to contribute to a specific

topic that is listed on each reference card. The move towards a complete DSS simply means, in the crudest form, that one produces in the computer the equivalent of the card system. At a slightly more sophisticated level, powerful database software, such as dbase III, can be utilised; at an even more inspired level, one may wish to take advantage of software such as Memex Search Engine, which is explained later (it relinquishes one from the need to specify fields as a basis for search), and ultimately, one could comprehend the use of a full expert system in marketing to identify what is relevant to a particular decision and then search for it.

It seems, therefore, that whilst one can say that the ultimate is MkIS developing into DSS, it is perhaps more realistic to consider:

(1) that marketing can itself be subdivided into sub-systems related to the elements of the marketing mix and this forms the basis for the initial design of a MkIS;

(2) that each element of the marketing mix and its supporting internal and environmental information can be developed separately with a view to integrating each sub-system with the whole marketing system;

(3) that information for operation decisions is well defined and easily specified;

(4) that information for strategic marketing management decisions is often:
— ad hoc,
— qualitative, and
— can be gathered and analysed over longer periods than information for tactical marketing decisions, and

(5) that one is likely to spend considerable time developing information for tactical middle management decisions, with the result of considerably improving this aspect of marketing management.

If one accepts the above points, it follows that MkIS may be developed over a protracted period of time on a modular basis. A short period is required for introducing operating management information, a longer and more involved concentration on information for tactical management, and the possibility of postponing the development of a full DSS for strategic management until the earlier modules have been successfully implemented.

Structure of a MkIS

The structure of a sophisticated MIS or DSS was shown in Figure 1. The main features of the system include an interface, statistical bank, model bank and data bank. This structure will also support a total MIS, and, in doing so, one gains the benefits of sharing with other functional areas of business:

(a) Statistical and forecasting routines which are applied in many situations.

(b) Models such as spreadsheets for sensitivity analysis or systems dynamics models for testing policies of the firm.

(c) Generally applicable input, output and change routines that allow information to be cancelled or updated.

(d) Data which can be shared by different departments, for example, sales data may be

used by marketing as a basis for forecasting future demand, by finance as a basis for providing accounts, as well as by production departments as a basis for planning future production throughput and stock requirements.

By ensuring that marketing shares the same structure and database as the rest of the organisation, the advantages of developing a single database for the firm are achieved. According to Cuozzo and Kurtz (1973), these are:

(1) The ability to respond quickly to changing business needs by having a well-organised pool of interrelated business data.

(2) A reduction in program and file maintenance costs because data organisation methods offered in a database management system are more flexible.

(3) Improve efficiency by the consolidation of diverse systems operations and staff skills.

(4) Reduce data storage costs by eliminating data duplication and redundancy, thus enhancing the timeliness and validity of the data.

It is for these reasons that a firm should ultimately endeavour to strive towards an integrated MIS. However, if one initially develops the tactical decision-making system within the marketing module, then the data bank can be sub-divided into the areas which make up the marketing mix. The interface will be dealing with input and output which may be gathered "on-line" from an external database, input manually as the outcome of marketing research or collected on a continuum between purely manual collection and fully automatic internal data capture. The output from any of the other banks may be displayed on the terminal in the form of alpha numeric data or graphics, the same data can be displayed as hard copy, or it can be transferred from one bank to another in the form of file information, thus reflecting the internal flows between banks.

The model bank provides a capability to assist directly in marketing decision making and should contain models which help to understand market behaviour, the effect of pricing and promotion on product demand, and it should reflect the firm's performance related to competitors' activities. These models should be of varying detail within each marketing area, and the best level of detail in any particular situation will depend on time and resource constraints balanced against the effects of improvements in decision making and operations.

The statistical and forecasting bank provides the basis for estimating and formulating of budgets, and should incorporate methods for both quantitative and judgemental estimation.

Eventually, as the system incorporates strategic decision making, the basic MkIS must be flexible enough to interface with powerful external databases, and new internal hardware and software, such as the Memex Search Engine or an expert system. It is at this point in the development of the system that one appreciates most of all the need to identify long-term as well as short-term system objectives at the outset.

The development of a MkIS is a dynamic process, so it is sound management practice to move forward in terms of development phases followed by periods of consolidation. It is in these periods of consolidation that

the new aspects of the system are brought into the general management process for the total MkIS, which will periodically review such areas as:

(1) data collection and storage;

(2) data retrieval and analysis;

(3) data presentation, and

(4) systems planning and development, including the identification of new modelling and statistical techniques.

This dynamic approach for the development of a MkIS over a protracted time period, which is dictated by the size and complexity of the organisation and its markets, will, in our view, lead to better decision making in marketing, but in a way that can be "digested" by an organisation because the pace of development is controlled and tuned to the management style of the firm in question.

The next section gives examples of how the information needs of marketing can be satisfied by information systems of varying sophistication. The cases show a willingness to develop formalised systems to support decision making, and how information, even qualitative, can be suitably structured. Having clear objectives can limit the size of the system, while still satisfying requirements and allowing scope for future expansion. Finally, they show that while the hardware and software are important, human judgement also has a critical role to play.

Case Study — Style Financial Services

Style Financial Services, a subsidiary of Ray Scott Finance Group, a fast-growing consumer credit card organisation based in Scotland, recognised its need for a formalised information system when plans were being made for a major relaunch of its services.

The system was designed to aid the development of both strategic plans, covering the next three years and operational plans for the next year. Initially, an analysis was made of the functions and information needs of these two levels, and the sources that could satisfy them. These included external data, such as government publications, specialist media, specialised surveys such as Mintel, financial research survey, economic forecasts as well as occasional reference to such research services as TGI and BARB data. More informal observation of competitors' and customers' activities was also included. This was intended to allow a full marketing audit and environmental analysis.

Internal data were held in both computerised and non-computerised format. Non-computerised data included all customer application forms, statements, vouchers and sales slips, and complaint correspondence. Internal computerised data were held on mainframe, controlled by a specialist DP department within the parent company.

This computerised data bank was extremely large and complex, and had been designed for accounting purposes. While direct access was possible by a linked terminal, the complexity of the data file and the non-user friendly software meant that special requests were, instead, made to the DP specialist whenever data were required. This was given in hard copy, usually of relevant cross-tabulations, which were then summarised by the market analyst and distributed to relevant people within the organisation. Various other reports were received which also required analysis and forwarding.

To aid in translating these internal computer reports into a format of use to strategic and operational planning, PCs and Lotus 123 software were used. Relevant aspects of the external and internal data were extracted, either in original or summarised form, and manually fed into the PC. The PC was then used to merge and represent the data and answer various "what if" questions, the output then forming the basis for internal marketing reports on different scenarios. No statistical or model bank exists at present, these functions being sent to external specialist agencies as required. The PCs were available to any managers who wished to carry out their own analysis or investigation, as was access to the original hard copy and external information. While various other files were held on the PCs, such as personnel records, retailer sales ledger and a management accounts package, it was not thought necessary to link these.

The marketing information system was therefore "grafted" on to the mainframe which was generally inadequate for marketing purposes. Historical customer data had not been kept until the MkIS system was integrated, making analysis of purchasing patterns and credit movements impossible. The present record structure is unsuited to marketing, and would require extremely expensive software to make it suitable and increase its user-friendliness. At present the MkIS matches present marketing needs and no intention exists to change either PCs or software.

To improve the MkIS, it is intended to replace the mainframe database with a more marketing-orientated structure, but it is thought that PCs will still be used to analyse data, rather than direct terminal access to the mainframe. (This is because of the size and complexity of the customer database which can be most usefully understood in summary form and the problems which would be caused by constant amendments to the database.) This also gives the benefit of individuals being solely responsible for the PC, whereas access to the mainframe would require a formal DP request. The benefits that might flow from a move towards a DSS system (by integrating PCs and mainframe, more sophisticated software, etc) would be balanced against the cost of achieving this. At present, the system satisfies the objectives for which it was designed. The company feels the MkIS is essential to its business, allowing it to react to the marketplace in a planned informed manner, highlighting potential weaknesses in image or offering, monitoring advertising and promotional campaigns etc. As such, it is an essential element of the firm's decision making which would otherwise be arbitary and defensive. Relevant information is provided, in the form needed, as and when required. The sifting and analysis of raw data is performed by the market analyst and PC, rather than decision maker, and the sophistication of the system matches the sophistication of the company and its marketing needs. As such, while unsophisticated in computing terms, it is sophisticated in terms of amount and type of information provided, being a blend of human/ computer analysis, and qualitative and quantative data.

Case Study — Pilkington Medical Systems

In 1985, Pilkington Medical Systems (PMS), a leading health care company manufacturing and selling medical lasers, was involved in a teaching company scheme with the Department of Marketing at the University of

Strathclyde. The main thrust of the work was to analyse the high-technology medical capital equipment market. A two-pronged approach was taken, studying the UK in the medium term and the world market in the long term. The research addressed such issues as market size, maturity, competition, buyer behaviour and product/technology awareness.

As the results from the research were being made, PMS highlighted a serious shortcoming in its strategic and tactical marketing effort. It was addressing a customer base whose awareness of the product and understanding of the associated technology was limited and occasionally non-existent. Marketing the "obvious" benefits of this technology — cost saving, time saving and reduced patient trauma — was not therefore easy.

Considering the two main issues, the need to educate potential customers and formally to store important market intelligence led PMS to consider building an MkIS giving priority to the "Laser Information Service" (LIS). The aim of the LIS was impartially to disseminate state-of-the-art technical and clinical information to the medical community at large. Its success has been twofold: firstly, as a marketing tool, it has been endorsed by the number of competitors who are now offering a similar service, and, secondly, as an educational tool with its approval last year by the British Medical Laser Association.

The system, designed by one of the authors, runs on the Psion "Archive" relational database. Archive runs on the IBM PC or clone and can create databases in excess of 60,000 records (each with a possible 255 fields of up to 255 characters). The number of databases is limited by the storage capacity of the hard disk only, and, with manufacturers claiming disc capacities of 700 Mbytes, storage is no problem.

A prerequisite for PMS was a system that could be used by non-computer specialists. "Archive" offers a programming structure that allows powerful menu-driven routines to be set up. "Archive" is one of a suite of four packages consisting of a database, spreadsheet, graphics and word processor that allow exchange of data between them. Considering the preferred approach to MkIS design and installation, a sub-system had been provided which was capable of being integrated into the full MkIS and which was providing immediate benefit to the company.

To date, the LIS has three databases. Two are dedicated to product-specific data and one to medical papers, reviews, books, etc, on the subject of lasers in medicine. It is the medical database that has attracted most attention and interest. Data records are held in the lowest form facilitating access at any level of detail. The interested party can select references by author, discipline, speciality, sub-speciality, laser type, date or any combination of these. Each query can result in a different selection of records uniquely suited to the individual requirements.

As a result of the LIS, the company has accrued several benefits:

(1) unique element of the promotional mix;

(2) customer educational tool;

(3) enhanced high-technology image;

(4) professional image as a result of its approach to a market-wide issue;

(5) recognition as the UK centre for medical laser information with the possibility of extending its reputation throughout Europe;

(6) employee training aid, and

(7) service to society goals.

The company is now involved in a detailed study of marketing requirements to expand the MkIS.

Case Study — Memex

As previously mentioned, computing is moving increasingly towards DSS applications. Ever-decreasing hardware and software prices, coupled with increasing sophistication, has led to an immense and growing body of stored information. Data entry by word processing, computerised typesetting and the use of optical character recognition devices has been largely responsible.

Historically, the CPU and application software were heavily biased toward numerical applications. Consequently, data held were predominantly numerical. In stark contrast, much of today's data are of a textual nature. Retrieval from unstructured text, using conventional technology, usually requires imposing a fairly rigid structure on the data and employing keywords. This not only restricts query freedom, but makes database maintenance a time-consuming task, often requiring computer specialists.

As senior management rely more and more on timely and pertinent textual data for strategic decision making, a few manufacturers recognised the significant benefits that text exploitation systems can offer. The Memex Information Engine is an example of just such a system.

Memex, located in East Kilbride in the west of Scotland, was formed in 1980 to develop and produce information retrieval co-processors. The Memex Search Engine is designed to provide the inexpert user with a tool, not only for direct and easy searching of such information, but also for the maintenance and editing of the database itself. The system co-processor renders it largely independent of the host CPU, thereby freeing it for other functions.

The system operates by producing a compressed, encoded database which is searched directly by the search hardware. As it is the data itself which is searched, no indexes or occurrence lists need be created or maintained, and everything in the database is checked against the enquiry.

The encoding process is a single-pass operation that replaces each different token (words, symbols, single characters and numbers) in the original text by a unique code. The coded tokens are placed in the coded database while a record of each unique code to token assignment, with the exception of those for numbers, is stored in a special file called the vocabulary.

The encoded database is an exact mapping of the original text where each token in the original text has a coded equivalent in the coded database. The database, which typically takes up 40 per cent of its original size, can be made secure by limiting access to the vocabulary. The vocabulary is relatively small in relation to the database and reduces further as the database is added to, as most added words will already have been recognised.

Search speed varies with the type of text being searched, out typical English is searched at about ⅓ million words per second. Speed is limited by disc delivery rate, but not by query length or complexity.

Query procedures allow a humanistic approach to investigations, so that, through database browsing and query refinement, a high degree of precision can be achieved.

In April 1987, Peat Marwick installed a system to search databases of company and executive information. This database is of mixed and ever-changing textual information, and the search facilities provided by the Memex system are "solving problems that no other system could tackle".

The breakfast TV programme "Good Morning Britain" relies heavily on archive material to support news items and features. TV AM's News Information Department catalogues and indexes its video library. The team of researchers responsible typed brief descriptions of each news item and then cross-referenced summaries on a card index system. One can easily imagine the complexity of cross-referencing to meet all future needs. They sought to computerise the system to improve efficiency and service. The conventional database system offered few improvements over the manual card system. With the Memex system, they were able to store full descriptions of the tapes and these could be easily added to. Using this system, even the most recent tapes were available for search.

Conclusion

It has been argued that the collection, processing and usage of information is of major importance to the role of marketing managers, and that information systems can help in both their day-to-day operational role and also their more long-term strategic planning role. While early systems were more suited to structured decisions, such as in accounting or sales analysis, developments in software and increasing capacity of hardware have increased their usefulness for unstructured decisions, such as are frequently met in marketing planning.

The capacity now exists for linking different internal databases, as well as accessing external information sources. As software improves, Decision Support Systems become increasingly attractive, promising increased efficiency and effectiveness for the early adopter.

The message of this article is that the time has come for a serious consideration of how your organisation will either initiate its first computerised MkIS, or how it will upgrade its existing MIS to satisfy the requirements of the marketing department. This should not be done on an *ad hoc* piecemeal basis, but as part of a long-term planning exercise. The MkIS should integrate with existing databases and provide both simple sorting and processing capability, as well as containing the potential for more extensive modelling of market or customer behaviour. By adopting this approach, the system will adapt to the style and organisation of the company, rather than the other way around.

■

Figure 3.
Technical Overview

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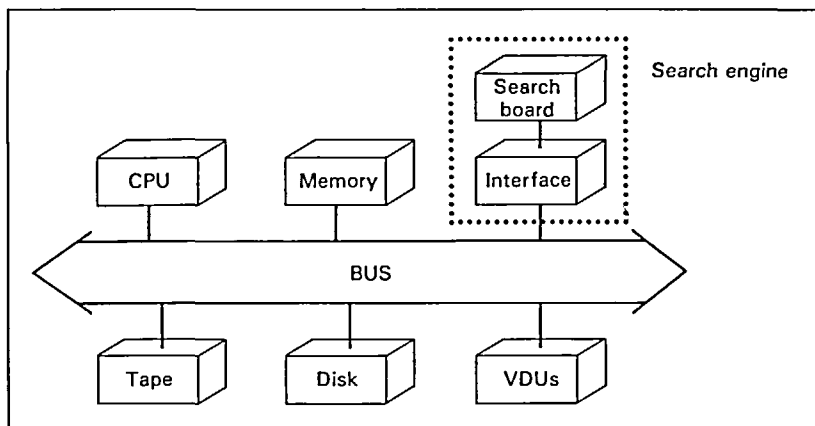Berry, D. (1983), "Marketing and the Micro", *Business Marketing*, December, pp 44, 48-53.

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