

**"AN INTEGRATIVE PERSPECTIVE ON DESIGNING
MANAGEMENT SUPPORT SYSTEMS"**

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An Integrative Perspective on Designing Management Support Systems

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Abstract

This research presents a new integrative perspective for the design of management support systems (MSSs). Three different objects of decision support (outcome, process, and learning) are combined with three different modes of decision support (automate, informate, and stimulate) to yield significant system design characteristics in terms of restrictiveness, guidance, and customizability of MSSs. The dominant matches in the proposed integrative perspective (outcome, automate, and restrictiveness), (process, informate, and guidance), and (learning, stimulate, and customizability) characterize three typical decision support situations and have implications for the design of appropriate MSSs. The implementation of these conceptual ideas are illustrated in Brandframe, a MSS for supporting a brand manager in the domain of fast moving consumer goods. An empirical evaluation of Brandframe in a leading Dutch company is also presented in the paper.

Keywords: Management support systems; decision support systems; knowledge-based systems; frameworks for design of decision support systems; marketing applications of decision support systems and knowledge-based systems.

1 Introduction

This Section emphasizes the importance of decision support systems in organizations and describes the focus and structure of the paper.

1.1 Decision Support Systems

Most early applications of computers in organizations considered well defined, operational tasks (such as accounting) and the resulting computer systems focused primarily on transaction processing and information presentation. In 1971, Gorry and Scott-Morton [19] coined the term "decision support systems (DSSs), and argued for the importance of designing computer systems to support the decision processes of managers. Such computer applications were seen to be different (from earlier applications) in focusing on tasks which were variable, less routine, poorly structured, and more strategic in orientation.

Over much of the next decade, the design and development of DSSs was strongly influenced by quantitative modeling approaches from management science and operations research. Such model oriented DSSs proved to be useful for relatively well structured and rigid tasks in organizations. However, they did not have the desired impact on supporting the decision processes of managers.

Little [33] observed that the "*..big problem with management science models is that managers never use them*" and suggested the incorporation of a manager's subjective judgments into the model-bases of DSSs. The importance of explicitly incorporating the tacit knowledge of managers in decision processes is supported by experimental evidence. Moriarty and Adams [38] showed that for the prediction of sales for two durable products, a management judgment forecast outperformed a sophisticated Box-Jenkins model. Blattberg and Hoch [6] found that in a business forecasting situation, a combination of model and manager always outperformed either of these inputs in isolation. Other experiments [12,28] confirm that managers easily accept and use research results confirming prior beliefs and do not easily substitute their own mental models with the results of objective analyses. These results motivated the coupling [24,49] of DSSs with expert systems and other ideas from the field of artificial intelligence [14], and led to a new generation of *knowledge-based DSSs*.

Though the field of DSSs is more than two decades old, there is disagreement even today about the definition of the term "decision support system". While researchers have proposed many restrictive definitions of a

DSS, we favor a more general definition, such as the one proposed by Silver [44]: “A *decision support system is a computer-based information system that affects or is intended to affect how people make decisions*”. Though the principles grounding our research are applicable to all DSSs, our focus in this paper is on DSSs which support managerial decision processes. Thus we use the term “MSS” (Management Support Systems) [43] in the rest of this paper to refer specifically to DSSs which are designed for supporting managerial decision processes.

1.2 Focus and Structure of Paper

This research presents an integrative perspective for the design of MSSs by relating the object and mode of decision support required from the MSS to dominant system design characteristics. The object of decision support is concerned with the question: what to support? Three different objects (see Section 2) of decision support are emphasized in our research: outcome (emphasis on the final decision), process (focus on the process of decision making), and learning (emphasis on improving the decision and decision procedures). The mode of decision support relates to the question: how to support? Three different modes of decision support (see Section 3) are considered in our integrative perspective: automate (automation of the decision), informate (emphasis on creating and providing information about the decision and the decision process) and stimulate (active stimulation for innovative decision making). Desired MSS design characteristics can be described in terms of Silver's ideas [44] of restrictiveness, guidance, and customizability of MSSs (see Section 4).

The dimensions of object and mode of decision support can be viewed as defining the requirements on MSSs - the demand side. Silver's classification [44] can be seen as describing particular DSSs design characteristics - the supply side. Dominant matches between the objects and modes of decision support are mapped onto Silver's characterization of MSS design characteristics in our integrative perspective as described further in Section 5. Figure 1 summarizes the important aspects of the decision situation considered in this research. Most of the attention in the literature on MSS design has focused on methodologies for the implementation of MSSs within organizations [5]. In this research, we are concerned with the design of a MSS and not with its implementation within organizations. Thus our

integrative perspective does not include many important implementation aspects such as involvement of end-users and top management commitment.

Figure 1 about here.

The implications of the integrative perspective presented in this research are illustrated through the design of a marketing MSS called Brandframe. Brandframe has been designed to support the decision processes of brand managers in the domain of fast moving consumer goods. The particular characteristics of the decision situation facing a brand manager (described in Section 6) can be interpreted in terms of our integrative perspective and it leads to specific design choices in Brandframe (outlined in Section 7). The last Section of the paper (Section 8) highlights the contribution of our research, provides comparisons with prior research and outlines directions for future research.

2 Object of Decision Support

Different objects - outcome, process and learning - of decision support are described in the following sub-sections. They reflect three answers to the question: what to support?

2.1 Outcome

The outcome support view of decision making is primarily concerned with the final decision. The relevant question in this context is: what is the decision? The emphasis is on ensuring that the best or "correct" output is produced for an appropriate set of inputs. The procedure used to transform the inputs into the outputs is not of primary concern.

The outcome support approach of decision making is favored by a high degree of structure in the decision problem, low uncertainty in the decision environment, end-users with low skills levels (potentially causing undesirable outcomes), and a rigid organizational decision environment (in which the focus is on getting specific outcomes).

A MSS with a focus on supporting outcomes would typically encode one or more decision models and provide friendly interfaces for inputting data and interacting with managers. Most MSSs with a strong dependence on operations research models emphasize such a view of decision support.

2.2 Process

In a process oriented view of decision making, the emphasis is on the process by which decisions are made, and not solely on the final outcome. The relevant question in this context is: how is the decision reached? MSSs are seen [44] as interventions in the decision process which interact with and impact the decision procedures of decision makers.

A process focus in decision making is useful for both structured and unstructured problems when there is uncertainty in the decision environment, the end-users are skilled and the organizational decision environment is flexible. With increased information about the decision process, skilled end-users can flexibly and meaningfully change critical parts of decision processes to respond to changes in the external decision environment.

The process model of decision making cited most often in the literature is Simon's [45] four phase model of decision making: intelligence (finding occasions for making a decision), design (determining possible courses of action), choice (choosing among the determined set of courses of action), and review (evaluating past choices). Despite its popularity, Simon's decision model has several limitations. For example, Gorry and Scott-Morton [20] have pointed to the fact that managerial problem solving really consists of a series of inter-dependent, temporally separated decisions, and there is the important phenomenon of learning as a manager solves a problem over time (as depicted in Figure 2). These inter-dependencies play an important role in supporting managerial decision processes and are not captured in Simon's model.

Figure 2 about here

2.3 Learning

When the object of decision support is learning, the relevant question is: how to improve the decision and the decision process? The ability to question decision procedures and adopt new innovative decision procedures is seen as a critical component of organizational learning. Morgan [37] has mentioned that while most organizations have become proficient at single loop learning (i.e., the ability to detect and correct errors in relation to a given set of operating norms), many organizations are yet to develop skills for double loop learning (i.e., the ability to question the operating norms used for single loop learning).

Further, Zeleny [52] has argued that no aspect of a decision process should be fixed a priori because decisions emerge as “harmonious” patterns balancing the different decisional components (such as criteria, alternatives, and constraints). There is less of a need to model human thinking by logical rules and algorithms and more of an emphasis on providing a flexible decision environment with the ability to capture “habits of mind” (patterns) conditioned on specific contextual knowledge [52]. These ideas are related to the need for utilizing experiential knowledge and learning across different decision cycles (as depicted in Figure 2).

Though learning is possible in all decision situations, a focus on learning in decision making has the most value for unstructured problems in dynamic decision environments. It is also necessary to have skilled end-users and an organizational decision environment which is flexibility and encourages innovation.

3 Modes of Decision Support

As mentioned earlier, the mode of decision support is concerned with the question: how to support? Three different modes of decision support are described below: automate, informate and stimulate.

3.1 Automate

Automation of decision making has been the traditional strength of DSSs and other computer-based applications. MSSs with an emphasis on

automation have certain decision procedures and mechanisms "hard-coded" into the system. For example, an optimization package can automate the allocation of resources for a particular business problem.

From a decision making perspective, there are three major impacts of automation: prescription, proscriptio, and integration. The model(s) encoded in a MSS can explicitly prescribe a "preferred" or "normative" decision procedure. A MSS can proscribe a decision task by allowing the decision maker to choose between a restrictive set of alternative solution procedures. MSSs can also integrate the results of different models and facilitate the management of interactions across temporally separated decision cycles (Figure 2).

3.2 Informate

The term "informate" was first used by Zuboff [53] to denote the capability of intelligent technology to capture and provide information about organizations. While Zuboff has focused primarily on the "informatization" capabilities of data oriented information systems (such as databases), the same concept can be extended to MSSs and the decision processes of decision makers.

In the informate mode of decision support, a MSS captures information about the different aspects of the decision situation, such as "what opportunities or problems triggered the decision process?" and "how different solution alternatives were generated and explored", and uses this information to support and aid decision making by the manager. For example, knowledge about how the decision space was navigated along with reasons, if any for the particular path followed can informate managers and provide them with insights into their own decision procedures or those of others. Information about the progressive evolution of the solution together with comments and notes about critical steps in the process can significantly enhance decision support, specially for less experienced decision makers.

3.3 Stimulate

The primary focus within the stimulate mode of decision support is on stimulating decision makers in double loop learning by aiding the questioning of existing norms and decision procedures. Proper stimulation can aid learning in decision makers and help them to notice special features in the decision environment, explore different solution designs, test alternative hypotheses, and reflect on the obtained results. This is in agreement with recent views that a MSS should aim to provide a rich decision environment for the manager to experiment, learn and reflect till a stage of cognitive equilibrium [1,8,52] is reached.

For example, a collection of descriptions of decision processes can serve as a valuable base of knowledge to stimulate reflective learning in decision makers by recognizing the strengths and limitations of prior decision processes. These insights can lead to innovations in decision processes. This “vertical” stimulation from an “horizontal” informing base (a collection of details of prior decision processes) is depicted graphically in Figure 3.

Figure 3 about here

Most MSSs are strong on the automation dimension and tend to focus on automating (via model solution) all or parts of decision procedures. MSSs currently existing in organizations have little or negligible informative and stimulative components.

4 System Design Dimensions

The system design of a MSS should be related to the object and mode of decision support required from the MSS. The relevant question in this context is: what is the impact of the MSS design on the decision support requirements? We consider below Silver's framework [44] identifying the following three types of MSS system design characteristics: restrictiveness, guidance, and customizability.

4.1 Restrictiveness

MSS restrictiveness has been defined [44] as “the degree to which, and the manner in which, a MSS limits its user’s decision-making processes to a subset of all possible processes”. MSS restrictiveness cannot be measured in absolute terms, and is affected by subjective contextual and perceptual conditions of the decision process.

4.2 Guidinace

This refers to the ability of MSSs to guide and influence the discretionary powers of decision makers during the decision process. While system restrictiveness delimits what decision makers can do with MSSs, system guidance describes [44] “..subject to what users can do, how the system affects what they do”. Highly restrictive systems limit the degree of decisional guidance possible and vice versa.

4.3 Customizability

This refers to the degree to which decision makers are able to adapt and specialize MSSs to fit the special characteristics of their respective decision situations. The customizability of a MSS is generally related inversely to its restrictiveness. Highly customizable systems can adapt better to the changing needs of decision makers.

Most conventional MSSs can be characterized by high restrictiveness, low decisional guidance, and low customizability. The emphasis on prescriptive automation within these MSSs tends to restrict decision makers and lower the degree to which they can customize the systems.

5. An Integrative Perspective for the Design of MSSs

This section outlines the dominant matches between the different objects and modes of decision support and presents an integrative perspective to guide the design of MSSs.

5.1 Dominant Matches

Automation can be guided towards producing a particular outcome (producing a fixed output for a certain set of inputs), or a decision process (fixed decision procedures), or learning (automatic triggering of learning oriented situations - such as exception conditions). Informatization can be about outcomes (tracking outputs for input conditions), processes (recording critical phases in decision processes), and learning (recording how certain decision patterns emerged over time). Similarly stimulation can be directed at outcomes (e.g., "is this the right output for the inputs?"), decision processes (e.g., "is this the best process to take the decision?"), and learning (e.g., "is this the best way to improve the decision?").

While all of the above different emphases are possible, each object of decision support can be seen to have a dominant match with a particular mode of decision support. Automation is best at producing a fixed outcome for a certain decision situation. Informatization can provide the most useful information about the decision process and stimulation is best suited for enhancing learning in decision makers and the decision environment. These dominant matches are depicted in Figure 4.

Figure 4 about here

5.2 An Integrative Perspective

Figure 5 presents our integrative perspective for the design of MSSs. The perspective maps the system design dimensions of Silver [44] onto the dominant matches between the objects and modes of decision support as explained below.

Figure 5 about here

Highly restrictive MSSs are best suited to the outcome object and automate mode of decision support as they tend to limit choice. If the primary organizational consideration is that a particular outcome is reached, then highly automated and restrictive MSSs are appropriate. These characteristics make it possible for the MSS to prescribe or proscribe preferred or normative decision procedures. Most current MSSs can be

classified into this category. While automation and restrictiveness can be beneficial in promoting consistency and quality of decision making, they can have negative consequences in hampering innovation and limiting creativity through exploratory learning.

Guidance oriented MSSs are well adapted to the process object and informate mode of decision support. If the process by which decisions are made is of concern to the organization, then it is important to design MSSs which are able to provide high degrees of decisional guidance to managers and informate them about “how to” navigate through the decision space. Few MSSs truly fit into this category. While many MSSs have been proposed in the literature [25,29] to help decision makers choose between operators or solution techniques, they do not really capture knowledge of decision processes and use it for informing decision makers (see [2] for an exception).

The learning view of decision making calls for greater emphases on stimulation and customizability in MSSs. If the organization wants to learn and innovate continuously in its decisions, it is important to design MSSs which stimulate decision makers into new exploratory modes of problem solution and allow them to continuously adapt the MSSs to the changing decision needs of the environment. While the ability of MSSs to promote learning was recognized early [23], it is only recently that MSS architectures are emphasizing learning. Approaches to learning in MSSs include proposals for virtual agents [1,34,35,39,40] which observe, challenge and stimulate the decision maker, and case-based stimulation [2].

Note that our integrative perspective is not normative with regard to the object and mode of decision support to be emphasized in a MSS. All three object and modes of decision support are equally useful for different organizational environments and purposes. However, given some requirements on the object and mode of decision support to be provided by the MSS, the perspective guides the design of a MSS. This is illustrated below with the help of Brandframe.

6 Brandframe: A MSS for a Brand Manager

The experimental domain of fast moving consumer goods has been chosen in this paper to illustrate the ideas described in the preceding sections. A MSS called Brandframe has been implemented to support the decision processes of a brand manager. This section introduces the experimental domain for our research and the decision environment of a brand manager. It also provides some background information about prior marketing MSSs and motivates the overall architecture of Brandframe.

6.1 Experimental Domain for Research

A prototype of Brandframe was developed over a period of 18 months (starting in early 1991) using KAPPA - a PC-based expert system shell tool (marketed by Intellicorp Inc.) integrating rules and object oriented programming. This prototype version of Brandframe was demonstrated to various brand managers in Holland. Their response to the system was very enthusiastic, and many were interested in implementing Brandframe within their own companies. Brandframe was subsequently implemented for a limited set of brand managers over a period of 7 months in Holland Fast Moving (HFM)¹. HFM, which is a wholly owned subsidiary of a major international company, is a leading company in the production and marketing of products in the category of fast moving consumer goods. An empirical evaluation of Brandframe within HFM was conducted after its implementation [11] (see Section 8.1) to confirm the value of Brandframe.

The screen dumps of Brandframe given later in this paper are from an earlier prototype version of Brandframe. Due to the sensitivity of company related information, we are unable to include screen-dumps from the version of Brandframe implemented in HFM. However, the prototype version of Brandframe is sufficient for demonstrating the main ideas of this research.

6.2 The Decision Environment of a Brand Manager

In the domain of fast moving consumer goods, brand management is a dominant form for organizing the marketing function. The brand manager

¹ The authors are unable to disclose the actual name of the company HFM in the paper at the current moment.

has a stereotypical role that can be (to a large extent) generalized to other companies.

A brand manager is responsible for his brand in a fairly complex environment. The results for his brand (sales, market share, profits) are dependent on a large number of factors and events in the market: consumer preferences, brand perceptions, own marketing strategies (advertising, packages, sales promotions, and actions), strategies of competing brands, actions of retailers, and social and political events in the environment. The market is usually not a homogeneous entity, but consists of different sub-markets and market segments.

The decision environment of a brand manager is characterized by uncertainty, incomplete knowledge and rapid changes. The tasks of a brand manager [27] include (a) developing a long range and competitive strategy for the product; (b) preparing an annual marketing plan and sales forecast; (c) working with advertising and merchandizing agencies to develop programs and campaigns; (d) stimulating support of the product among the sales force and distributors; (e) gathering continuous intelligence on the product's performance, customer and dealer attitudes, and new problems and opportunities; (f) designing specific marketing programs (such as sales promotions); (g) implementing specific marketing programs; and (h) reviewing the impacts of the implemented programs. Figure 6 gives a graphical representation of the primary activities of a brand manager. There are obvious similarities between Figure 6 and Simon's model of decision processes [45].

Figure 6 about here

To get a better insight into the job of brand managers at HFM, a detailed questionnaire was given to 34 brand managers. As part of this survey, the managers were asked to indicate their approaches to evaluating alternative marketing actions. Their responses are given in Table 1. It can be noted from Table 1 that the importance of different model and model-based approaches is significantly lower than experience, intuition and insight for a brand manager. Combining these observations with the fact that brand managers are skilled staff who operate with considerable independence and autonomy, it is evident that MSSs for brand managers need to provide a

flexible, learning oriented decision environment. This implies a greater emphasis on the informate/process and stimulate/learning matches along the different objects and modes of decision support from our integrative perspective.

Table 1 about here

6.3 Computer-Based Support for Marketing Decisions

Mathematical models in marketing first became popular during the early 1960s when some of the early books on this topic - such as [16] - started appearing. Marketing information systems arose during the late 1960s [9] with an emphasis on the collection and organization of the large amounts of marketing data that was starting to be collected. The era of marketing MSSs started during the late 1970s with Little [32] defining them as "a coordinated collection of data, models, analytic tools, and computing power by which an organization gathers information from the environment and turns it into a basis for action". The usual approach within marketing MSSs for supporting a brand manager's decisions has been the utilization of quantitative models, such as the Multiplicative Competitive Interaction (MCI) model [10] and BRANDAID [31]. While useful in many ways, these models are limited in their handling of qualitative factors/relationships, the treatment of incomplete, uncertain and heuristic knowledge, and are unable to tap the tacit knowledge of managers (see Table 1).

The first marketing expert systems started appearing in the literature during the late 1980s in the form of the PEP [4], NEGOTEX [41] and other systems. Wierenga [50] has reviewed prior research in marketing expert systems and noted that marketing expert systems are in their infancy. Only 27 different expert systems could be located in the literature. While it is certain that some systems are never reported in the literature, the number of reported systems is still fairly small. Further, actual on-going use of marketing expert systems in companies is very limited. Of the 27 systems considered, 15 were prototypes, and only four systems had applications designed around them. The reported marketing expert systems are also rule-based, restrictive and tend to automate the decision procedures of experts.

Marketing MSSs for supporting brand managers, either model based or expert systems, have tended to be restrictive systems with a predominant emphasis on automation and an outcome view of decision making. In view of the particular characteristics of the decision environment facing brand managers, it is important to redesign such marketing MSSs to emphasize the informate/process and stimulate/learning aspects of our integrative perspective.

6.4 The Architecture of Brandframe

The overall architecture of Brandframe is as depicted in Figure 7 (some screen dumps from Brandframe are provided in Section 7). Conceptually, Brandframe can be thought of as being composed of the following eight inter-connected modules.

Figure 7 about here

History & Prior Cases: This module is concerned with the acquisition and storage of decision processes and problem solving procedures followed by managers in different situations. Whenever a manager uses Brandframe to solve a particular problem, this module provides the capability to dynamically store descriptions of important phases and decision points encountered by the manager during the decision or problem solution process. This module is similar to case libraries in case-based reasoning systems [26,42], but is different in that the “cases” stored are detailed descriptions of decision processes (as in [2]) and not simply descriptions of problem-solution pairs.

Process Analyzer: This module is responsible for the analysis of decision processes and for the activation of specific process related help procedures. The process analyzer module decides upon important states, events and actions in decision processes which need to be stored in the history & prior cases module. It also provides guidance to the user in the analyses of prior decision processes. Thus the process analyzer module contains domain knowledge and user models to perform meaningful analyses of decision processes of brand managers. This module is similar to critics in critiquing systems [15].

World Modeling: As described in Section 6.2, the external environment for a brand manager consists of a constellation of brands and retailers with complex, inter-dependent links. These objects and their mutual relationships are captured in the world modeling module. This module also provides facilities for the manager to change and customize aspects of the external world (such as designate the set of competing brands).

Targets and Constraints Setting: Every brand manager “manages” a brand within a set of constraints to achieve certain targets. Targets can be of the form of “desired market share” and constraints can be like “maximum advertising expenditure”. These targets and constraints have an important impact on decision processes and their outcomes. These aspects are managed by the targets and constraints setting module.

Monitoring and Tracking: Relevant information (such as sales, market shares, and competitive actions) are periodically inputted into Brandframe from different sources (such as scanning panels, trade press, and business contracts). This module is responsible for monitoring the information arriving from the external world, tracking important features (depending upon the targets and constraints faced by the brand manager) and signaling exception conditions calling for immediate attention.

Diagnosis: This module helps the brand manager to interpret and relate changes in critical variables (such as sales and market shares) to events in the external world (such as actions of competing brands) and internal actions and constraints (such as prior marketing actions taken for the brand).

Program Designer: The program designer module generates and designs alternative marketing actions which can influence developments in a favorable direction such as restore lost market share or neutralize a competitor's actions, and helps in the choice and design of the marketing program such as sales promotions, advertising campaigns, and price reductions, which is most appropriate given the diagnosis and the current targets and constraints.

Report Generator: This module provides important capabilities for the interface between the manager end-user and Brandframe. It enables the brand manager to retrieve and look at different historical and current

information about the decision environment and processes. The emphasis within this module is to provide a friendly, graphical interface for the retrieval and analysis of information.

6.5 Use of Brandframe

Brandframe has been designed to support the particular needs of a brand manager's decision environment. The top level menu of Brandframe allows the brand manager to perform the following types of functions:

1. Define/change brand situation: A brand manager represents his own vision of the market in Brandframe. In particular, the manager decides on issues such as:
 - the relevant market/product class for his brand (a coca-cola manager can for example see his brand as a soda brand, or as a cola brand);
 - the distinct sub-markets/sub-product classes in that market (e.g., low calorie, special taste, etc.);
 - possible segmentations (e.g., sex and job-type); and
 - important competing brands and their relative characteristics
2. Set targets and budgets: The manager sets volume targets (his own goals) and advertising and sales promotion budgets (his constraints).
3. Report market data: The brand manager reads and accesses market data. Currently Brandframe reads bi-monthly Nielsen data and combines it with other internal company data in its display representations.
4. Analyze a specific period: The brand manager uses Brandframe to analyze brand-related data for a specific time period. In particular, the aspects analyzed include:
 - position of the manager's brand, i.e., aspects such as volume share and changes since last period, shares in distribution channels plus changes, volume of brand relative to market volume and comparisons of actual and target volumes;
 - key competitors and their relative positions;
 - marketing mix elements such as awareness, distribution, price, product perceptions, advertising and promotion.

5. Design a marketing program: Based on the results of the analyses and/or the recommendations of Brandframe, a brand manager designs a specific marketing programs such as advertising and sales promotion. For example, Brandframe assists with the advertising budget and design (advertising frequency and product attributes to be emphasized) recommendations.

It should be noted that there is no one fixed approach to using Brandframe. A brand manager can choose to freely mix and match the above user functions. The use of Brandframe is explained in more concrete terms with screen dumps in the following section.

7 Decision Support in Brandframe

As described in Section 6.2, the decision environment of a brand manager calls for a greater emphasis on the informate/process and stimulate/learning dimensions of our integrative perspective. This section describes how the decision support capabilities and design of Brandframe can be analyzed using the integrative perspective presented earlier.

7.1 Outcome/Automate/Restrictiveness

Brandframe incorporates several common marketing models - such as Little's decision calculus model [33] for the determination of advertising expenditures. However, the automation emphasis within Brandframe is not on generating model-based solutions, but rather on attempting to augment the process and learning aspects of decision making.

The task of a brand manager can be viewed as consisting of a sequence of decision phases as shown in Figure 6. Brandframe prescribes (in a non-binding fashion) a certain sequencing of the decision phases. For example, after the diagnosis of a certain situation, Brandframe automatically prompts the user to activate the module for the next decision phase - the design of an appropriate marketing program (see Figure 8). This prompt is non-binding as the user can always choose to explore some other alternatives in the diagnosis module rather than move on to the design of a marketing program or choose to design a marketing program other than that suggested by

Brandframe. Note that should this happen, the process analyzer would record this fact (together with any justification input by the manager for ignoring the suggested choice) and use it to informate users in the future.

Brandframe proscribes certain aspects of the decision situation by allowing the consideration of a fixed set of alternatives. For example, Brandframe only allows for the consideration of 5 different marketing programs (such as sales promotions, advertising, retailing, and price) as shown in Figure 8. Such choices about the appropriate set of marketing programs and devices and their related goals are made by the system designer (in consultation with the brand managers using the system) and tend to restrict the brand manager in a binding manner.

Brandframe also automates the integration of certain process aspects along the temporal and inter-model dimensions. For example, in the bulletin message window of Figure 9, Brandframe can be seen performing some temporal comparisons on the values of certain important process variables.

Figures 8 & 9 about here

An analogous impact of automation can be also observed for the learning view of decision making within Brandframe. Brandframe proscribes and proscribes conditions under which certain stimulative messages are generated. The aim of these messages is to enhance learning by stimulating reflective learning in the manager and encouraging the exploration of other paths by the questioning of assumptions grounding the decision process. For example, consider the message in the bulletin window in Figure 9. Parts of the message in the window reads "... this price movement is significant and causes competitive disadvantage. You should consider action to compensate..". This message was generated by Brandframe after performing an internal analysis of the current decision situation, the actions of the brand manager (using the system) thus far and expectations of future consequences. Messages like these are continually generated by Brandframe depending upon the development of the decision process. They cumulatively aim to enhance double-loop learning within the brand manager.

7.2 Process/Informate/Guidance

7.2.1 Current Decision Process

Brandframe includes facilities to continually informate the brand manager about the current decision processes. This information is displayed in bulletin windows as shown in Figures 8, 9 and 10. The kind of information captured by Brandframe includes actions performed by the manager, answers given to specific questions, the activation sequence of the decision modules, and the results of internal analyses performed by Brandframe under various conditions (such as comparisons with other competing brands as shown in Figure 10).

Figure 10 about here

At any point in the decision process, the brand manager can scroll through the bulletin window and review important aspects of the decision process navigated thus far. Brandframe informates the manager about important details of the decision process and the manner in which the decision space has been explored. Besides providing a permanent record of the decision process, this informing capability serves to enhance learning via passive stimulation. With a conventional outcome oriented MSS, detailed knowledge about "how a decision was reached" is usually lost with attention typically being focused on the initial problem and the final decision ("what decision was reached"). However, important knowledge about the decision is contained in the detailed process of decision making: "why did the brand manager consider that option? why did the brand manager not choose the other option? on which aspect of the problem did he spend the most time? what particular sequence of decision phases was followed?" and so on. The informing capabilities of Brandframe captures such information and uses it to informate managers. The simple fact of being able to observe the process of navigating the decision space can help (upon review) to highlight strengths and weaknesses of decision processes and lead to improved decision making.

Note that the informing capabilities of Brandframe are different from the "explanations" generated in expert systems. Expert systems usually "lead" users through a series of questions, and then present an "explanation"

describing why each question was generated and how the entire sequence of questions and answers led to the final decision. Brandframe does not “lead” the brand manager. The brand manager is free to explore any of the eight different modules of Brandframe (Figure 7) in any order as desired and take any appropriate actions. What Brandframe does do is record the particular sequence of actions performed and questions raised by the brand manager (with results of internal analyses, if any, performed by Brandframe) together with the final decision. It does not attempt to “explain” the final decision. Explanations, if any, are contained in special comments entered by the user (such as reasons why a particular choice was not considered) or in the results of analyses of the situation presented by Brandframe periodically to the user (see Figures 9 and 10).

7.2.2 Prior Decision Processes

The power of the informing mechanism within Brandframe is enhanced by the case library (contained within the history and prior cases module) which stores descriptions of prior decision processes. Thus a brand manager can not only review the current decision process, but can also review prior decision processes. This is very useful for aiding inexperienced brand managers who can learn by being informed about the decision processes followed by more experienced brand managers. A simple clarifying example is useful for explaining further.

Decision processes in Brandframe are stored using three types of entities: states/outcomes, events (caused by the external environment), and actions (performed by the brand manager). Assume that at some stage of the current decision process, the brand manager asks Brandframe (either on his own initiative or in reaction to Brandframe's active prompt) to find a similar prior decision situation. The process analyzer module searches through the prior cases in the history & prior cases module. After comparing the current state in the current decision situation to prior cases, the process analyzer retrieves the most similar prior case - the case titled “market down” from January 1992. This prior case consists of different states, events, and actions. Figure 11 shows how this can be done.

Figure 11 about here

The manager can look at any state, event or action in the retrieved case and read information and comments specific to that object. The manager can also ask Brandframe to suggest other objects to look at (with the “Suggest” button in Figure 11). Brandframe then analyzes the retrieved case “market down” and (among other aspects) looks at relationships between the object currently under consideration and other objects, and suggests related objects to the manager. Assume that the state “market share slightly down” is currently being looked at and that it is related to other objects as shown in Figure 12. Then Brandframe would suggest (along with justifications) the states “Rainy weather”, “More rain and storms” and “Market share down more”, and event “Market reports in” to the brand manager. The manager can continue the process as desired by either looking at another object and invoking the help of Brandframe for new suggestions or asking for an alternative case to be retrieved.

Note that the guidance procedure described above is different from “case-based reasoning” as described in the literature [42]. There is no attempt to “adapt” a prior solution to the current situation as Brandframe does not subscribe to an outcome view of decision making. Rather, the aim is to stimulate the manager in thinking about the decision process and enhancing learning which leads to improved decision procedures. The emphasis is on supporting the decision process and not on replicating the final outcome. Thus most of the features in this module are oriented towards analyzing and suggesting information/guidance to the manager about the decision process represented in the case relative to the current decision situation (faced by the manager).

Figure 12 about here

7.3 Learning/Stimulate/Customizability

7.3.1 Active and Passive Stimulation

Brandframe provides both passive and active stimulation to brand managers. Passive stimulation results from the informing capabilities of Brandframe described in the preceding sub-section. The ability to observe the process of navigating a decision space and to compare and contrast several different (prior) decision processes (Figure 3) can stimulate reflective

learning in brand managers. The learning mechanism is passive because no “stimulative messages” are given by Brandframe to the manager and the brand manager plays the deciding role in choosing to review current or prior decision process information.

More active learning results from the system taking a pro-active role in stimulating learning in the brand manager. An example of this is the prompting of special stimulative messages under certain conditions as shown in Figures 9 & 10. Another important example of active stimulation is in the interaction of the history & prior cases and process analyzer modules. Figure 3 depicted how vertical stimulation can result from an informing base of descriptions of prior cases. The process analyzer module can under certain conditions (such as no action from the manager-user for more than a specified amount of time) trigger a prompt asking whether help is desired from prior cases. If the brand manager answers positively, then the process analyzer module in conjunction with the history & prior cases module takes the initiative to retrieve one or more similar cases (prior decision processes) and helps the manager in navigating through the prior cases.

Most of the stimulative messages in Brandframe are oriented towards the structuring of decision processes. An example can be seen in Figure 8 where Brandframe visually represents the degrees to which different marketing programs are desirable. It suggests a certain program (outcome) and provides a brief justification for its choice. The brand manager can use this justification to think about the appropriateness of the suggested marketing program and decide to accept the choice or explore the justification for the selection (or the rejection) of another marketing program. Brandframe also contains facilities to perform “what-if” analyses (similar to those present in many other knowledge-based systems and MSSs) which allow the user to experiment with multiple scenarios and question assumptions.

In addition to the above, Brandframe aims to stimulate brand managers by providing easy access to information about different marketing models and strategies. For example in Figure 13, Brandframe provides explanations of different devices for the sales promotion marketing program. The brand manager can thus not only be informed about the current decision process, but can also have access to general marketing information

available in books and company documents. Though not included in the current version, multi-media can be used to present richer forms of information such as the TV advertising clips used for that brand. Our interviews with brand managers have indicated that they would highly value such a richer presentation of brand and market related information. This stimulation via access to information is usually passive in nature (obtained at the request of the user), but it can be also presented actively (such as in Figure 13 where the explanation of the suggested sales promotion device appears automatically).

Figure 13 about here

7.3.2 System Customizability

Besides the usual customization facilities offered in MSSs of entering specific constraints and targets, Brandframe allows managers to customize aspects of world models and decision processes. The external world for a brand manager was described in Section 6.2 as a complex, inter-linked set of brands (and retailers). The perception of this external world is dependent upon the mental models of brand managers. For example, two brand managers may perceive different sets of competing brands for the same brand. As there is no “correct” choice of the structure of the domain model (such as the right set of competing brands) and due to dynamic changes in the world (such as the creation of new brands) it is important to give the ability to the brand manager to customize the world model in the MSS to suit his mental model. Thus Brandframe provides facilities to allow brand managers to edit (create/delete/modify) product categories, brands, market segments, and other important market related features. Performing most these manipulations is simple from an implementation point of view as it involves the modification of the object hierarchy representing products, brands and markets. However, this object hierarchy is transparent to the user who only perceives the categories consistent with his mental model as depicted in Figure 14.

Figure 14 about here

Additionally, each time a manager uses Brandframe, his specific decision process is captured and stored within the history & prior cases module. The

process analyzer module uses these prior cases to guide current decision processes as described earlier. The point to note is that progressively the decision support capabilities offered by Brandframe changes and becomes more and more customized to the manager's specific decision style and knowledge as captured in the history module. This is an important kind of customization support offered by Brandframe.

The cumulative impact of the customization abilities described above is that Brandframe adapts its reasoning and decision support capabilities to better match the style and knowledge of the brand manager. As a brand manager learns, the incremental knowledge (as reflected in the decision process) is stored within the history & prior cases module and influences the decision support offered by Brandframe later.

8 Conclusion

This section describes the empirical evaluation of the implementation of Brandframe, summarizes the main contributions of our research relative to prior research, and provides some concluding comments.

8.1 Empirical Evaluation of Brandframe

Brandframe was implemented and tested over a period of 7 months for two product groups within HFM. An informal evaluation was done during demonstrations of the system to different brand managers. During these demonstrations, some positive comments on the system included the following:

- The interactivity of the system: managers thought that the system often forced them to question their own thoughts and intuitions. One brand manager described the system as an "idea generator" or a "brainstorming partner";
- Ease of data access and integration: as data for the whole company is spread over several databases, managers reacted positively to having only relevant data as defined by their defined "world model" being present and easily accessible in the system. The ability to integrate different types of data such as Nielsen data, market research and intuition was also appreciated;

- **Productivity:** several features of Brandframe related to the access, analysis and presentation of data were seen as increasing the overall productivity of the managers;
- **Learning device:** the marketing knowledge contained within the system was seen as providing a useful advisory and instructional environment and stood in sharp contrast to other alternate MSSs in use;
- **User friendliness:** the system was perceived to be user-friendly and attractive to work with; and
- **Organizational memory:** some managers thought that Brandframe could serve as an "organizational memory" and help to transmit knowledge/experience to colleagues [46].

Some negative aspects of the system noted informally by the managers included the following:

- **Integration with existing systems:** users currently have to leave Brandframe to access other marketing information systems;
- **Dependence:** users suspected that over-reliance on the knowledge and assumptions within the system can result with regular use. This could be harmful if the assumptions changed in the external world but were not updated in Brandframe;
- **Additional features:** several features not currently available in Brandframe (such as category management) were asked for.

A more extensive evaluation of Brandframe was done by a questionnaire administered to the two brand managers (for two different product groups) who were using Brandframe during the testing period². The questionnaire was detailed and had several questions relating to different modules and features within Brandframe (see reference [11] for details). Table 2 lists the responses of the two brand managers to selected statements regarding their overall evaluation of Brandframe. The last column of Table 2 lists the average of their responses for similar statements for the existing alternate marketing MSSs³ within the company.

² Note that as the knowledge base of Brandframe has to be customized for each brand, Brandframe was implemented for two product groups only during the evaluation period. Hence the detailed questionnaire could only be administered to the brand managers responsible for these two product groups.

³ The alternate MSSs within HFM are representative of MSSs currently used by brand managers in leading international companies in the category of fast moving consumer goods.

While the results of Table 2 have to be interpreted cautiously due to the small size of the sample, they are a reasonable first evaluation of Brandframe. Some simple observations can be made. Brandframe clearly gets better ratings for flexibility, ease of use and usefulness. The mode of decision support is definitely not perceived as automation but more to support the process of decision making. There is some discrepancy between the two brand managers in their perception of the stimulate/learning role of Brandframe. Though the informal comments obtained from brand managers included the potential for use as a "learning device", more extensive investigations need to be conducted in this regard. Brandframe is continuing to be implemented in HFM and we intend to conduct a more thorough set of evaluations after an extended implementation.

8.2 Comparisons with Prior Research

Several frameworks for MSSs have been proposed in the literature and they can be classified along four broad categories depending upon their relative emphases:

- **Technology focus:** Some frameworks such as [7,13] emphasize the technological tools and platforms underlying the design of MSSs;
- **Development focus:** Frameworks in this category [17,22,36,48] focus on activities related to the development of MSSs such as systems analysis, implementation, training and evaluation;
- **Decision support focus:** The essential concern in such frameworks [19, 21, 30] lies on decision support issues such as the relation of MSSs with decision making needs and the impact of MSSs on decision processes;
- **General :** Such frameworks [3,18,44,47] attempt to include all of the above aspects of technology, development and decision support in one all-encompassing model.

Proponents of general frameworks argue [44] that the complexity of the DSS field - reflected in the numerous interacting technological and behavioral issues - requires an over-arching model. However, such frameworks run the

risk of either becoming overly complex and detailed or staying at a shallow level of abstraction. Thus rather than trying to develop a general framework in this research, we have emphasized a framework with a decision support focus. Such a decision support focus is in our view the most critical aspect of the design of MSSs. This research avoids a technology focus because of two reasons: first, the technological components of MSSs are changing rapidly and second, it is our belief that the principles of MSS design from a decision support perspective are largely independent of the underlying technological bases. The same technological components can be used to produce two very different MSSs (from a decision support perspective) and vice versa. A development focus is essential for ensuring the success of MSSs in organizations and this aspect has been researched considerably in the literature where studies have tried to relate system success with organizational features affecting the implementation process. These aspects are beyond the scope of this research.

Existing frameworks with a decision support focus have tended to have a dominant task or problem emphasis, such as task structure of Gorry and Scott-Morton [19], task interdependency of Hackathorn and Keen [21], decision structure of Lerch and Mantei [30] and the distinction between institutional and ad-hoc MSSs by Donovan and Madnick [13]. The perspective presented in this research integrates three different objects (outcome, process, and learning) of decision support with three modes (automate, informate, and stimulate) of decision support to yield significant MSS design characteristics (restrictiveness, guidance, and customizability). Such an approach is not centered on the task or problem to be tackled by the MSS. This research takes the position that given a particular task/problem, the factors affecting MSS design are more related to the object and mode of decision support rather than the task/problem itself. This is because the same task/problem can be tackled by different foci on the objects and modes of decision support. Depending upon the required relative emphases of the objects and modes of decision support, different requirements are imposed on MSS design. For example, a MSS for medical diagnosis may be designed in an outcome/automate approach for naive users. An alternate MSS for the same medical diagnosis problem may be designed in the process/informate approach for more experienced users.

Our integrative framework extends and augments prior research, most notably that of Zuboff [53] and Silver [44]. Zuboff [53] was the first to make the distinction between the automating and informing impacts of computer-based systems in organizations. While Zuboff only considered traditional transaction processing and management information systems in her research, we have extended her ideas in two directions in this research. First, we have added the third dimension of "stimulate" to the two impacts identified by Zuboff: automate and informate. The ability of computer-based systems to stimulate managers and workers is an important feature which is becoming more common with the maturation of artificial intelligence technologies. Second, we have extended her ideas about informatization from databases (and related management information systems) to the informatization of managers about decisions and decision processes.

Our integrative perspective incorporates Silver's model [44] of system design characteristics, but places it in the context of the object and mode of decision support. Silver identifies two generic forms of guidance: suggestive and informative, but does not use or extend Zuboff's [53] concept of informatization to MSSs. While the potential benefit of providing decision traces to users is mentioned, he does not provide descriptions of specific means (or systems) implementing it. His suggestive guidance is related to the stimulate component of the role perspective in our research, but is mainly focused on suggestions regarding structuring the decision process in terms of operators, inputs and models to be used.

Lerch and Mantei [30] have proposed two criteria for evaluating MSS frameworks: (a) how well the framework facilitates communication between researchers and practitioners; and (b) how well the framework provides aid and guidance for MSS design. We believe that our integrative perspective measures up well along both of these dimensions.

We have deliberately kept our integrative perspective compact and clear. We could have added additional dimensions and/or allowed for more variations along each dimension, but we feel that it would both decrease the ease of applicability of the framework and reduce its comprehension by managers and MSS designers.

Our integrative perspective requires two simple but important questions to be answered for determining the design of MSS:

- What is the object of decision support required from the MSS?
- What is the mode of decision support to be provided by the MSS?

The answer to each question influences the design of the MSS as was illustrated for the case of Brandframe in the earlier sections. Note that our integrative perspective does not prescribe a unique object and mode of decision making. Typically most MSSs would emphasize different aspects of the object and the mode dimensions to different degrees. It should also be observed that the task/problem to be tackled by the MSS is not of primary concern in answering these questions.

Some of the ideas implemented in Brandframe can be found in prior research. For example, researchers have defined the notion of active DSS [34,40,41], symbiotic DSS [35] and human-machine cognitive systems [51]. The concept of virtual agents has been introduced [1,39] to model the stimulative impact of MSSs on managers. Angehrn and Dutta [2] have implemented a case-based reasoning agent which performs many of the case-based stimulative actions contained in Brandframe. However, most of these prior implementations have been fairly adhoc and lacking a consistent conceptual basis. It is hoped that the integrative perspective presented in this paper fills this gap and provides a conceptual grounding for the design of intelligent MSSs.

8.3 Concluding Comments

The aim of this paper has been to outline the perspective guiding our research on the design of MSSs. We understand that the ideas expressed above are limited to the impact of decision support requirements on the design of MSSs and do not capture the complexities of the process of actually implementing MSSs in organizations - such as tensions between end users and corporate MIS groups and difficulties in perceiving true end user demands.

As the next phase of our research, we intend to continue our empirical experiments in HFM and other companies. We would like to enhance the

capabilities of Brandframe to learn patterns and associations from information about prior market situations, actions, and resulting outcomes. This would allow the development of certain capabilities within Brandframe to gradually change its knowledge autonomously.

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**Requirements of
Decision Support
(Demand)**

**Characteristics of
MSS Design
(Supply)**

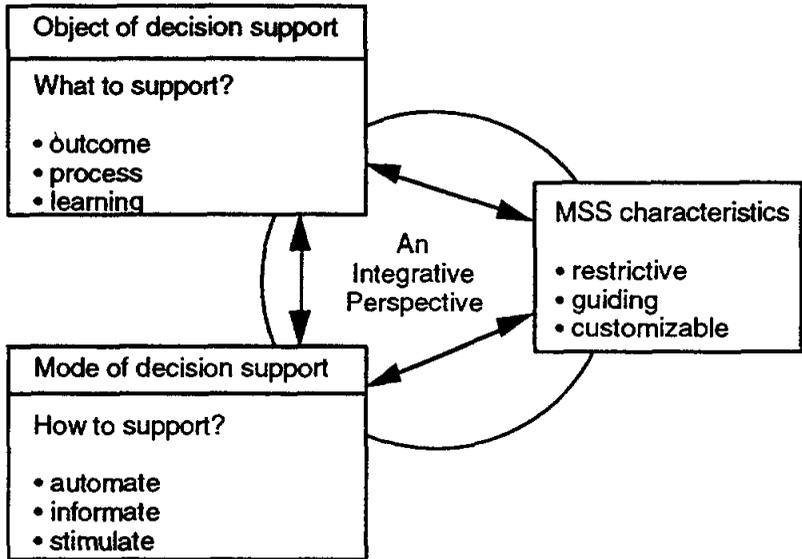


Figure 1: Aspects of the integrative perspective

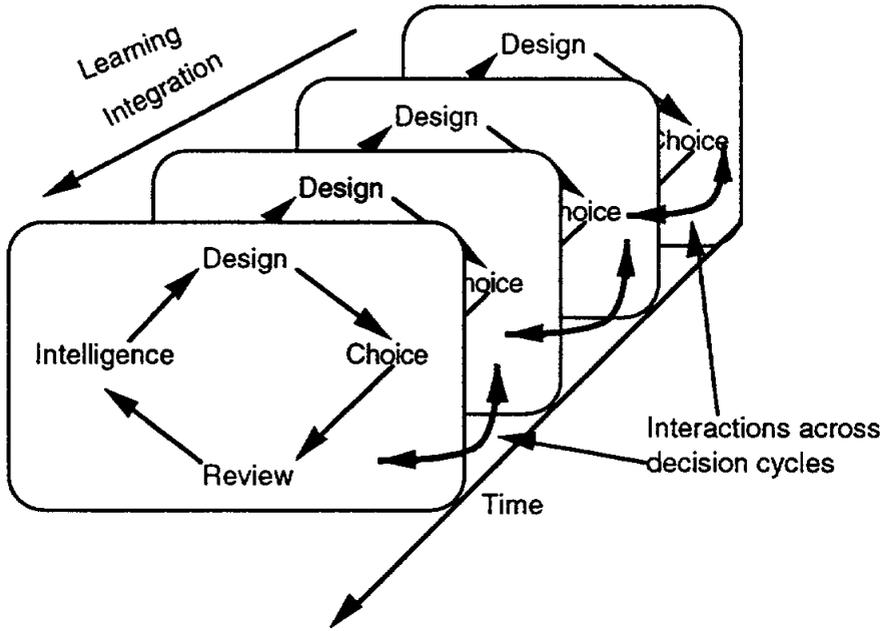


Figure 2: Interactions across different decision cycles

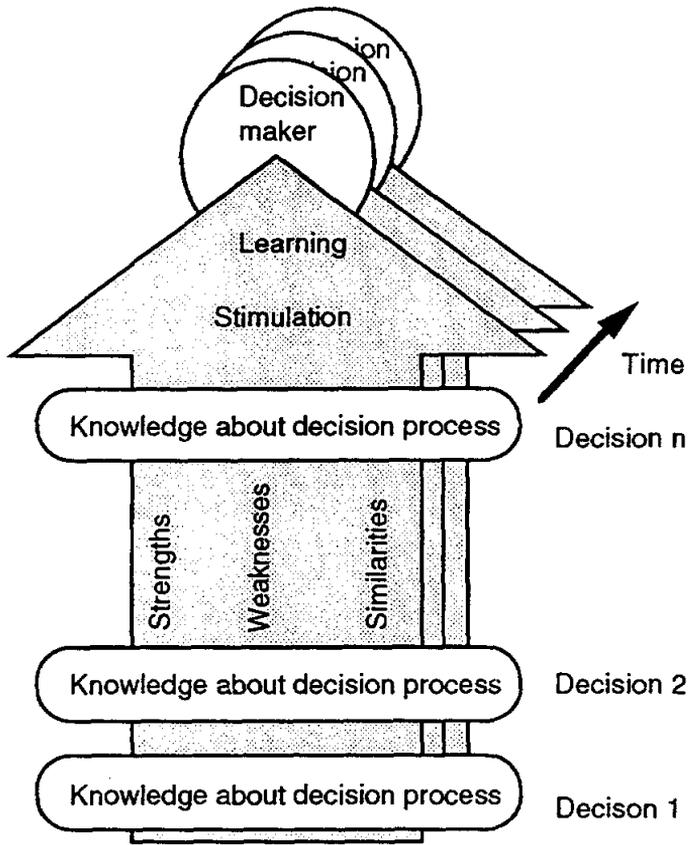


Figure 3: Stimulation from knowledge about prior decision processes

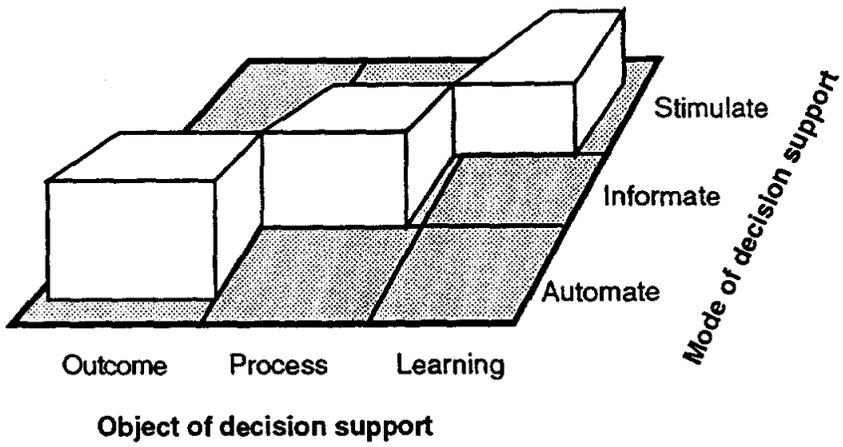


Figure 4: Dominant matches between different objects and modes of decision support

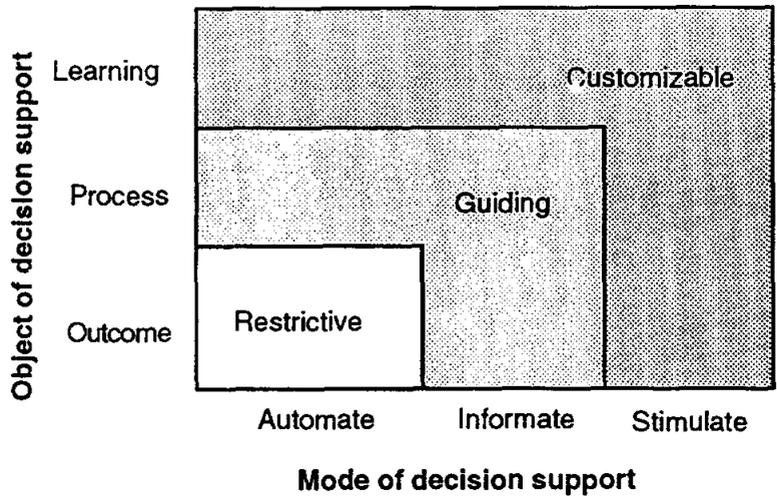


Figure 5: An integrative perspective for the design of MSSs

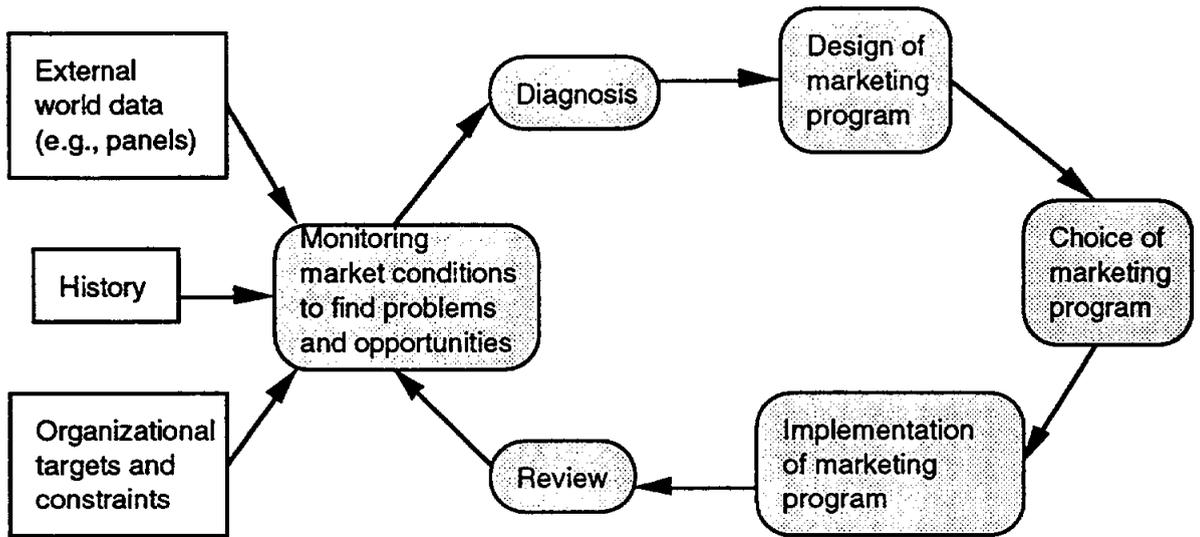


Figure 6: Typical activities of a brand manager

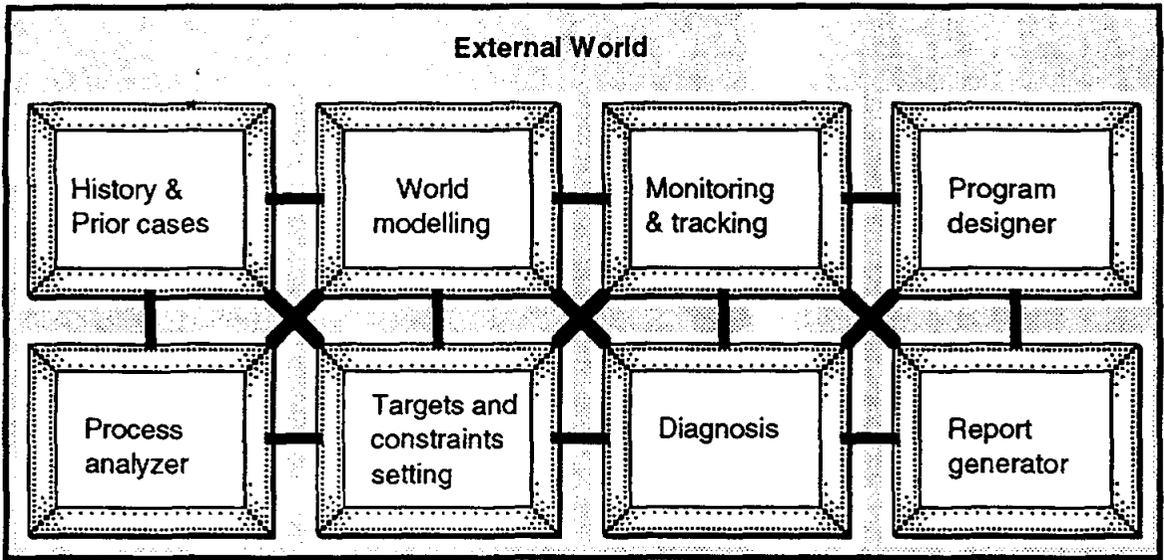


Figure 7: The conceptual architecture of Brandframe



Analysis for Heineken: period 4



Bulletin

RECOMMENDATION for strategy: Advertising: 35
 BECAUSE:
 Your awareness is down
 Your preference score is down
 Your advertising share is down
 Amstel has a higher preference score
 Amstel has aggressive sales promotion
 Amstel has aggressive advertising
 Amstel recently lowered its price

OTHER STRATEGIES:
 Sales promotion: 17
 Price: 13
 Product: 11
 Retailing: 4

Choose strategy to design program of

- Sales promotion
- Advertising
- Retailing
- Price
- Product




continue ...

Figure 8: Suggestion for marketing strategies by Brandframe



Analysis for Heineken: period 4



Bulletin

The average market price has changed from 81 in period 3 to 79 in period 4, while your own price changed from 82 in period 3 to 83 in period 4. This price movement is significant and causes competitive disadvantage. You should consider action to compensate.

Your advertising expenses were 1218 in period 3 and 1323 in period 4. This can cause some competitive disadvantage, while your advertising share compared to your competitors is down. Pay attention to your advertising share.

Pay special attention to the following brand(s):
 Grolsch: higher preference score.
 Amstel: higher preference score.

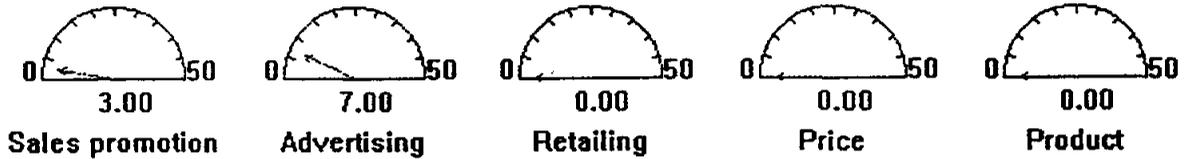
Choose the name of the threatening brand

Oranjeboom
 Grolsch
 Amstel
 Duvel
 Trappisten
 Amstel_Gold
 Heineken_Bok
 Stender
 Bavaria

Figure 9: A partial transcript of the decision process in Brandframe - I



Analysis for Heineken: period 4



Bulletin

Total contribution of the attribute Prestige is -2.08. Your last reported perceived score on Prestige (-1.6) is worse compared to the current average in Pilsener (average: -0.3). Prestige is considered to be an attribute of moderate importance (weight:1.3). Though being of moderate importance, watch this attribute and try to improve position by reducing the attached importance or by scoring better on Prestige.

Total contribution of the attribute Hangover_Pr is -1.05. Your last reported perceived score on Hangover_Pr (1.5) is worse compared to the current average in Pilsener (average: 1.35). Hangover_Pr is not considered to be an important

After reading the comments on the perceptual attributes, you can press 'continue ...' for further analyses.

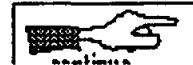


Figure 10: A partial transcript of the decision process in Brandframe - II

Session 7

Align Image Control Options Window Select

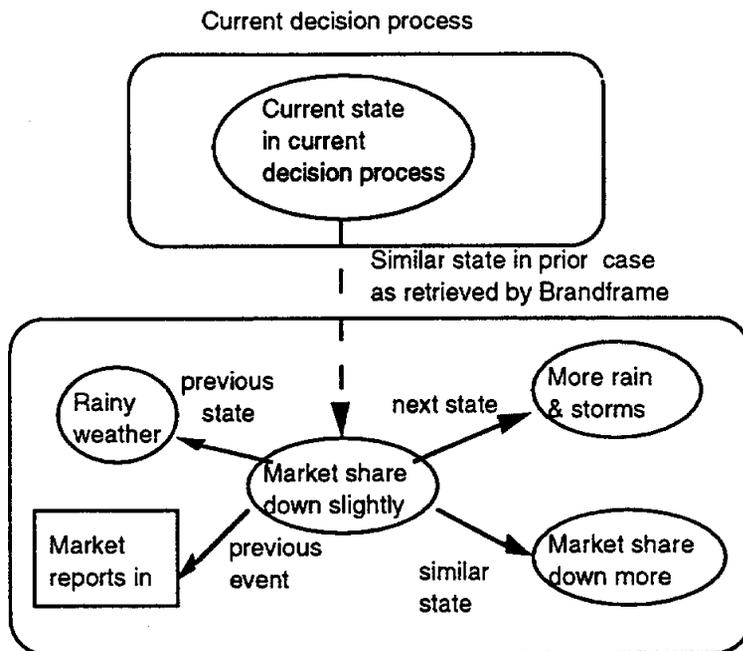
market down *Object: market*

12-01-1992 : 00:00	15-01-1992 : 00:00	15-01-1992 : 00:00	20-01-1992 : 00:00
rainy weather	market reports in	market share down slightly	more rain & storms
Goals	Goals	Goals	Goals
Goals	Goals	Goals	Goals

31-01-1992 : 00:00	31-01-1992 : 00:00	02-02-1992 : 00:00	25-02-1992 : 00:00
market share down more	market information from retailers	reviewed historical information	market information from retailers
Goals	Goals	Goals	Goals
Goals	Goals	Goals	Goals

States	Events	Actions	Case Summary	Case Highlights
market share down s more rain & storms rainy weather	market information fr market reports in market share down m	launched new adverti reviewed historical in	Previous Screen	Next Screen
			Suggest	Refresh Screen

Figure 11: Suggestive stimulation from prior cases



Part of retrieved prior (decision process) case: "market down"

Figure 12: An example of case-based stimulation in Brandframe

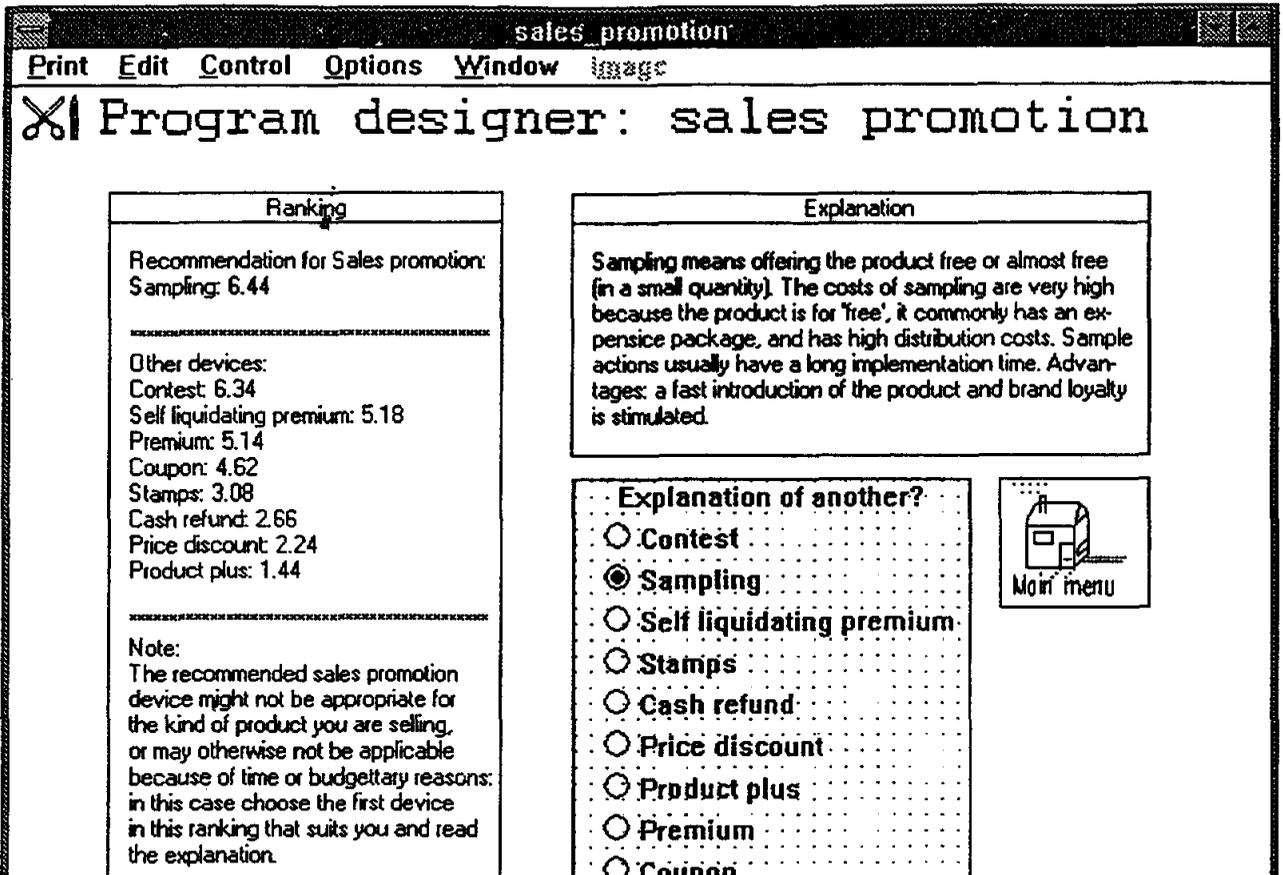


Figure 13: Recommendations and explanations in Brandframe



Current structure of the Beer market

SUBPRODUCT CLASSES	BRANDS	MARKET SEGMENTS
Pilsener Specials_Belgian Specials_Non_Belgian Non_Alc_Beer	<ul style="list-style-type: none"> * Pilsener_Brands: Amstel Heineken Grolsch Oranjeboom * Specials_Belgian_Brands: Trappisten Duvel * Specials_Non_Belgian_Bra Heineken_Bok Amstel_Gold * Non_Alc_Beer_Brands: Buckler 	<ul style="list-style-type: none"> * Geogr_Regions: Noord_Hol Zuid_Hol Noord_Ned Mid_Oost_Ned Mid_West_Ned Noord_Braband Limburg * Occupation: White_Collar Blue_Collar Students * Sex: Males

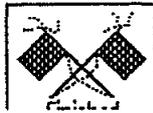


Figure 14: The market structure as seen by the brand manager

Manner of evaluation	Average
Experiment: e.g., test in market by market research	3.6
<i>Use models: mathematical models or simulation models</i>	2.0
<i>Experience, insight and intuition</i>	6.0
Other approaches such as consult with colleagues	5.3

Note: 1 = never; 7 = always

Table 1: Approaches to evaluating alternative actions

Statement	Mngr 1	Mngr 2	Alternate MSS
BF is useful for my work	6	6	4.9
BF enhances my achievements	6	6	4.7
BF improves efficiency of my work	6	6	4.8
I find it easy to let BF do what I want	5	6	4.3
BF has a low threshold for use	5	5	2
I would use BF often	5	5	2
You can have flexible interaction with BF	5	6	3.4
With BF I can make better use of data	7	6	3.3
BF is very useful in pointing at good analysis and solutions	5	6	3.3
BF is customizable: I can implement my own vision of the market	4	6	2.5
The most important function of BF is to automate the brand manager	1	2	3.0
The most important function of BF is to provide the brand manager information	5	6	5.0
The most important function of BF is to stimulate the brand manager	7	2	3.9
BF aims at generating a decision	1	2	2.7
BF aims to support the process by which the brand manager decides	7	6	4.1
BF aims to let the the product manager learn while practicing his job	5	2	2.3

Note: (a) BF = Brandframe (b) 1 = I don't agree; 7 = I agree

Table 2: Formal evaluation of Brandframe

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