CHAPTER TWO

Development of the Research Model

2.1 INTRODUCTION

In this chapter we develop the research model, used to study the effectiveness of marketing management support systems. This model describes the way marketing management support systems influence the performance of a marketing decision-maker. By testing the relationships in this model we answer the research questions posed in Chapter One.

We start this chapter with the construction of a general framework for the study. For this, we identify the classes of variables which are expected to influence the performance of a marketing decision-maker, using an MMSS. Next, we review the research conducted so far both in field of (general) management support systems and in the field of marketing management support systems. Based on the findings of this review we shall develop the research model. Therefore, specific variables within the classes of variables as described in the framework are selected and relationships between these specific variables are proposed.

2.2 THE FRAMEWORK

In our framework on the effectiveness of marketing management support systems (see Figure 2-1) four sets of dependent variables are considered: (1) the *performance* of the marketing decision-maker, (2) the amount of *time* used to make a decision, (3) the actual *MMSS-use*, and (4) the *evaluations* of both the decisions made and the use of the MMSS.

The dependent variables are assumed to be dependent on four broad sets of independent variables: the characteristics of (1) the *marketing management support system*, (2) the *marketing decision-maker*, (3) the *marketing problem*, and (4) the *decision-environment*.

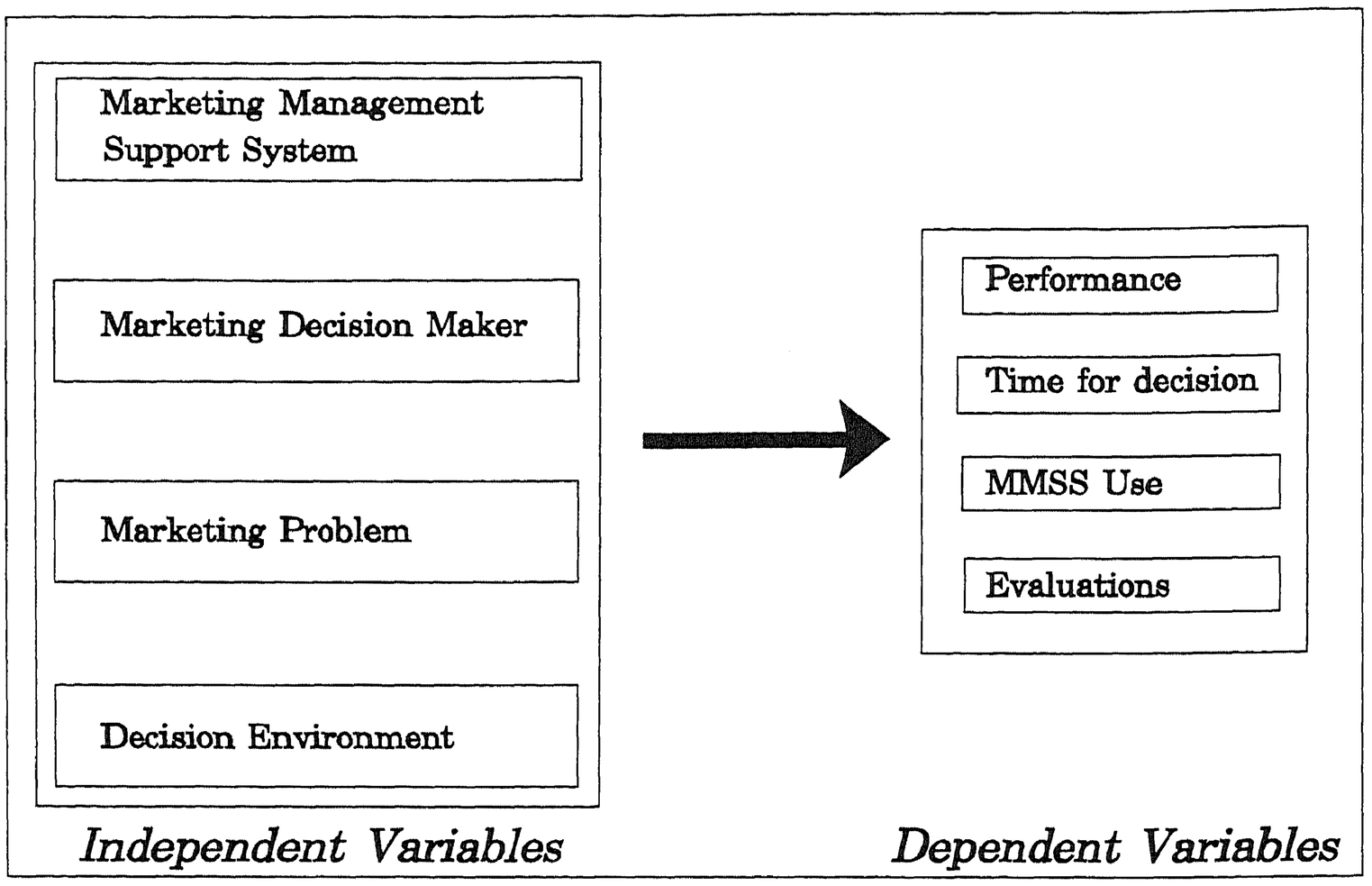

Figure 2-1 Framework for Research on the Effectiveness of Marketing Management Support Systems

Sets of Dependent Variables

The first set of dependent variables contains the *performance* variables. Performance variables refer to decision-outcome variables like profit, market share, and sales. These variables, which can be measured objectively, are concerned with the quality of the decision. In real-life marketing decision-makers are ultimately judged on these kinds of variables.

The second set of dependent variables is concerned with the amount of *time* decision-makers use to make decisions. In a competitive and rapidly changing market it is important that decisions are made within certain time limits. Therefore the time consuming effect of the use of MMSS should be studied too.

The third set of dependent variables refers to *MMSS-use* variables. MMSS-use refers to variables, which can be measured objectively, like the frequency of use and the amount of time used in one session of using the MMSS. By measuring these types of variables, insight is gained in the actual use of the MMSS.

Finally, the fourth set of variables contains *evaluation* variables. Two types of evaluation variables are distinguished: evaluations of the decisions made and evaluations of the use of the MMSS. The first category contains variables like decision-confidence. The second category contains variables like the perceived usefulness of the MMSS. While the former three cate-

gories of variables can be measured objectively, the evaluation variables are subjective variables.

Sets of Independent Variables

The dependent variables are expected to be dependent on the following four sets of independent variables:

Marketing Management Support System

In this study we investigate how the type of MMSS used by marketing decision-makers influences their performance. Most of the research in the (general) information systems research focused on the effects of technical characteristics of the IS, like different input and output modes or output formats (see for example the "Minnesota Experiments", Dickson et al., 1977). We study the effectiveness of different types of decision support. This means that we focus on the effects of the information the different MMSS provide, rather than on their technical characteristics.

Marketing Decision-Maker

The marketing-decision-maker variables can be categorized in two groups: (1) static, individual characteristics, and (2) dynamic, attitudinal decision-maker variables.

The individual characteristics are expected to have a constant value during the length of the experiment. They only change after a relatively long time period. The individual characteristics most relevant to MMSS success and performance can be grouped into two classes: personality variables and demographic/situational variables.

Personality variables refer to the cognitive and affective structures maintained by individuals to facilitate their adjustments to the events, people and situations encountered in life (Zmud, 1979). The cognitive style of a marketing decision-maker, defined as the characteristic mode of functioning shown by individuals in their perceptual and thinking behaviour (Witkin et al., 1971), is an example of a personality variable. The influence of the cognitive style of decision-makers has often been investigated in studies on the use and effectiveness of (marketing) management support systems. A frequently investigated relationship is the one between the cognitive style of marketing decision-makers and the design of MIS/DSS (Huber, 1983). The demographic/situational variables cover a broad spectrum of variables such as, for example, age, sex, decision-making experience and education.

The attitudinal variables are concerned here with the attitude towards the use of MMSS. Attitudes can be expected to change during the decision-making process (in the experiment).

Marketing Problem

A problem can be defined as a difference between the existing situation and the desired situation. For example, the problem of an unsatisfactory level of the market share, indicates a difference between the existing level of the market share and the desired level of the market share. To close the gap between the existing situation and the desired situation, decisions have to be made.

Marketing problems differ with respect to the level in the organization where the problem has to be handled. Three levels can be distinguished, i.e. strategic planning, management control and operational control (Anthony, 1965). The problems in the MARKSTRAT-world, the decision-makers have to make decisions on, can be conceived of as management control problems.

Solving a problem consists of a number of phases. Apart from the level, the characteristics of the phase in the decision-making process are also expected to influence the use of the MMSS and its effectiveness.

Simon (1977) distinguishes four phases in the decision-making process. The first phase is called the *intelligence* phase and concerns searching the environment for conditions calling for action. The second phase, in which the decision-makers invent, develop and analyse possible courses of action, is called the *design* phase. The third phase, selecting a particular course of action from those available, is called the *choice* phase. Finally, the fourth phase assessing past choices, is called the *review* phase. Each phase decision-makers have to go through can be conceived of as a problem in itself. To make the decisions in the MARKSTRAT-world, decision-makers go through all of the four phases.

Decision-Environment

This factor refers to the environmental setting the decision-makers are operating in. It concerns both factors inside and outside the organization. The kind of organizational structure the decision-makers are operating in, the competitiveness of the industry and the degree of time-pressure the decision-makers have to operate under, are examples of this factor.

In the next section we review research on the use and effectiveness of (marketing) management support systems that fits into the framework presented in this section. Based on this framework and on findings from the review, we develop the research model which is used in this study.

2.3 A REVIEW OF THE LITERATURE

In this section we describe research which has been conducted on the effects of (marketing) management support systems. A distinction is made between

theoretical and normative research on the one hand, and empirical research on the other.

2.3.1 Theoretical Research

First, we review research in the (general) information systems literature on the factors affecting the use and effectiveness of (M)MSS. Next, we review the research in the field of marketing science.

Information Systems

In the early seventies, in the information systems literature, research was reported on factors influencing the use and effectiveness of information systems. Four (groups of) researchers i.e. Mason and Mitroff (1973), Mock (1973), Chervany, Dickson and Kozar (1972) and Lucas (1973) developed frameworks and/or models to guide research into the factors that influence the use and effectiveness of information systems. Several empirical studies have been conducted on the basis of these frameworks/models.

Mason and Mitroff (1973) propose that:

> "an information system consists of at least one PERSON of a certain PSYCHOLOGICAL TYPE who faces a PROBLEM within some ORGANIZATIONAL CONTEXT for which he needs EVIDENCE to arrive at a solution (i.e., to select some course of action) and that the evidence is made available through some MODE OF PRESENTATION." (p. 475)

Mason and Mitroff thus view an information system as the entire system of the decision-maker, the information system (in the sense of the decision-aid), the problem the system is used for, and the environment the decision-maker is operating in.

In our framework the MMSS is defined as only the computer system: one of the four independent variables. For the sake of clarity, from here onwards, we limit the term information system to the decision-aid component. Therefore in our framework the MMSS is only one variable.

The variables of Mason and Mitroff (mentioned above in capitals) fit in our framework. PERSON and PSYCHOLOGICAL type are *marketing-decision-maker variables*[3]. PROBLEM is a *marketing-problem variable*. ORGANIZATIONAL CONTEXT is a *decision-environment variable*, and EVIDENCE and MODE OF PRESENTATION are *MMSS variables*. Mason and Mitroff suggest several states for each of their variables. They acknow-

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[3] From here onwards, the classes of variables from the framework are indicated in italics.

ledge that with the state of one variable, certain states of other variables fit best, and thus make the information system effective. This means that they assume interaction effects between variables.

Mock (1973) emphasizes the importance of behavioral factors of both the decision-maker who has to use the information system, and the decision-environment where the information system has to be used. These behavioral variables are expected to influence the effectiveness of the information system. Like us, Mock views the information system as the computer system alone. He states that the selection of an information system should be dependent upon the behavioral factors of the manager who receives the messages and who specifies the requisite actions. Examples of these factors are intelligence and analytical skills. Mock states that an understanding of behavioral aspects will enhance the information system designer's choice of selecting a satisfactory or even an optimal structure. This means that he acknowledges interactions between the behavioral variables and the characteristics of the information system. Mock presents a classification of behavioral variables that are potentially relevant. He distinguishes three classes of variables: (1) individual/psychological variables, (2) organizational/interpersonal variables, and (3) sociological and environmental variables. In our framework the first class of variables concerns *marketing-decision-maker variables*. The third class of variables are *decision-environment variables*. Within the second class of variables, Mock distinguishes *MMSS variables* (e.g. formality of the information system), *marketing-decision-maker variables* (e.g. management style), and *marketing-problem variables* (e.g. decision levels).

Chervany, Dickson and Kozar (1972) assume that the goal of designing and implementing management information systems, is to optimize the quality of the decisions. Therefore, contrary to the studies reviewed above, they suggest a number of measures to determine the decision effectiveness (or quality), like profit (*performance variable*) and decision-making time (*time for decision variable*). Chervany et al. developed a framework for conducting research in the area of management information systems analysis and design. This framework was used to guide the so called "Minnesota Experiments" (Dickson et al., 1977). In these experiments the effects of information system characteristics on decision-quality were studied. They assume the decision-quality to be dependent on three classes of variables: (1) decision-maker characteristics (*marketing-decision-maker variables*), (2) decision-environment characteristics (*decision-environment variables*), and (3) characteristics of the information system (*MMSS variables*). Chervany et al. do not distinguish a separate class of *problem variables*. They view, for example, the level of the decision (strategic vs. operational) as a *decision-environment variable*.

Chervany et al., like Mason and Mitroff and like Mock, believe that many interactions exist among the independent variables. For a given decision-maker and decision combination, a particular information system design may be most effective. If the characteristics of the decision-maker or the decision are altered, the required information system may need to be changed in order to obtain maximum decision-quality. This was studied empirically in the Minnesota Experiments (Dickson et al.,1977).

In the research, reviewed above, factors are mentioned that influence the use of the information system *or* the effectiveness of the user of the system. Lucas (1973) proposes a relationship between the actual use of an information system and the performance of the decision-maker. Lucas expects the performance of a decision-maker not only to be dependent on situational (*decision-environment*) and personal (*marketing decision-maker*) factors, but also on the actual use (*MMSS-use variable*) of the information system. The actual use of the information system is expected to be dependent on the quality of the system (*MMSS variable*), the attitudes and perceptions of the decision-maker (*marketing-decision-maker variables*), the situational and personal variables, and the decision-style of the user. The relationship between the use of the information system and the performance of the decision-maker is expected to be influenced by personal and situational variables, the decision-style and the ability of the decision-maker to analyze information and take appropriate action (as *marketing-decision-maker variables*). Lucas, finally, not only expects the use of an information system to influence the performance of the decision-maker. He expects that the performance, in turn, also influences the use of the information system (low performance is expected to stimulate the use of the information system).

Partially based on the frameworks/models reviewed above, other researchers like for example Ives et al. (1980) and Jenkins (1983) developed their own frameworks. These frameworks are not reviewed here since they were based on the four frameworks reviewed above. They do not seem to provide additional insights into factors influencing the effectiveness of (marketing) management support systems.

Marketing Science

In marketing science no complete frameworks or models on the use and effectiveness of MMSS have been developed. However, some researchers have suggested conditions which could be important for the effectiveness of MMSS. These conditions are reviewed here.

The emphasis in the marketing science studies is on factors which are important for a successful implementation of MMSS rather than on factors which affect the performance of the decision-maker. A successful implemen-

tation of an MMSS, in this literature, means that the MMSS is really used. Less attention is paid to the question as to whether or not it increases the effectiveness of the decision-maker. In the marketing science studies, first the role of MMSS characteristics was emphasized, later also the importance of decision-maker variables and decision-environment variables were mentioned.

As early as 1970, Little realized that a big problem with management science models, developed at that time, was that managers practically never used them. Little (1970) therefore proposed the concept of a *Decision Calculus* which he defined as a model-based set of procedures for processing data *and* judgments to assist a manager in his decision-making. Little suggests that to be used by a manager, and thus to be effective, a model should be simple, robust, easy to control, adaptive, as complete as possible, and easy to communicate with. He also recommends a form for the organization: a matrix form. Under this setup, as Little states, the manager not only has line responsibility but also has commitment from operations research or market research in terms of somebody assigned to this area. Little thus states that MMSS do not automatically increase decision effectiveness: both model characteristics (*MMSS variable*) and organizational characteristics (*decision-environment variable*) influence their effectiveness.

Schultz and Slevin (1972) propose a "theory of behaviourial model building". They emphasize the importance of user characteristics (*marketing-decision-maker variables*) for the use of the MMSS as an extension to the factors mentioned by Little (1970). According to their theory the probability of success (use) of a marketing decision-model depends upon how well the model represents a real market ("market validity") and also upon how compatible the model is with the organization using it ("organizational validity"). When both of those fit well the model has a greater chance of being used in making decisions. Like Little (1970), Schultz and Slevin thus expect the quality ("market validity") of the MMSS (*MMSS variable*) to be a determinant of the actual use (*MMSS-use variable*). Besides the quality of the MMSS, Schultz and Slevin also expect the organizational validity to influence the use of the marketing decision-model. The fit between a model and its organizational environment is supposed to be multidimensional. Both characteristics of individual users (*marketing-decision-maker variables*) and organizational characteristics (*decision-environment variables*) are included. Naert and Leeflang (1978) mention the same factors. Furthermore, they add a third category of variables: implementation-strategy variables.

Larréché and Montgomery (1977) also mention the importance of marketing-model characteristics (*MMSS variables*) for improving the likelihood of these models being accepted.

In 1979 Little again pays attention to a number of factors which influence the increase in marketing productivity by the use of a marketing decision support system. Little (1979) writes:

> "An MDSS means hiring people with marketing science skills. It means organizing data bases and putting them in a usable form. It means building a portfolio of models and analytic techniques directed at important company issues". (p. 25)

Little (1979) thus also notes the importance of the characteristics of the user of the system (*marketing-decision-maker variables*) for the use of MDSS.

Evaluation

In this section, theoretical research on the effectiveness of (marketing) management support systems, both from the information systems literature and from the marketing science literature has been reviewed. All of this research makes clear that the availability of marketing management support systems does not mean that they are automatically used nor that they are effective.

From IS research we learn that there are several factors which influence the actual use and effectiveness of MMSS. Mason and Mitroff (1973), Mock (1973), Chervany, Dickson and Kozar (1972) and Lucas (1973) mention a large number of factors (like IS characteristics, decision-maker characteristics etc.) that all fit in with the sets of variables in our framework. *Interaction* is assumed between information system variables and the other independent variables. Lucas (1973), furthermore, assumes a *relationship between* the *actual use* of the MMSS and the *performance* of the decision-maker.

From the marketing science literature no additional insights are gained about factors influencing the use and effectiveness of marketing management support systems. No complete frameworks or models on the use and effectiveness of MMSS are developed in this literature. A number of authors mention variables which can influence the implementation success of an MMSS. These variables also fit in the classes of variables of our framework and are not different from the variables mentioned in the IS literature. The implementation is conceived of as successful when the system is really used. However, a successful implementation, in this sense, does not automatically imply an increase in the performance of the marketing decision-maker. So the relationship between actual MMSS-use and performance, so far, has not received much attention in the marketing science literature.

None of the studies, reviewed in this section, takes account of evaluative (subjective) dependent variables like decision-confidence or perceived usefulness of the MMSS. Additional insight in the relationship between the

use of the MMSS and the performance could be gained by also looking at the role of these evaluative variables. These variables can be expected to influence the process of using the MMSS and performance.

2.3.2 Empirical Research

Apart from the theoretical research frameworks and models, reviewed in the last section, since the early seventies several empirical studies on the use and effectiveness of (marketing) management support systems have been conducted. The purpose of these studies on (M)MSS varied quite substantially, from looking at the effects of a particular design method of an (M)MSS, or the kind of interface of an (M)MSS, to looking at the effects of the availability of an (M)MSS. In this section a number of these studies are reviewed. This way we gain insight in what is known about the effectiveness of MMSS and the factors which influence this effectiveness. We start with a brief review of empirical studies on the use and effectiveness of (general) management support systems. Next, more detailed attention is given to the effects of *marketing* management support systems.

Empirical Research on Management Support Systems

Review articles of Dickson et al. (1977), Sharda et al. (1988) and Benbasat and Nault (1990) summarize the results of empirical studies on management support systems.

Dickson et al. (1977) summarize a series of experiments, known as "The Minnesota Experiments", which were conducted to examine the effects of various information system (IS) characteristics on decision-making. These experiments were conducted in the period 1970-1975. By varying the characteristics of the information system provided to participants, their impact on the decision effectiveness was investigated. Also investigated was the effect of decision-maker characteristics in interaction with IS characteristics on decision effectiveness. These experiments were all conducted within the framework developed by Chervany, Dickson and Kozar (1972), which was reviewed in Section 2.3.

The following important results, from the perspective of the effectiveness of MMSS, should be mentioned:

- Complex models and/or "hard to use" systems (both *MMSS variables*) may have little impact on user decision-making.
- Systems with complex or unfamiliar attributes (*MMSS variables*) may produce low user confidence and low user satisfaction (*evaluations*) with the system, even if operating results (*performance*) are better.

- Information-system designers should be sensitive to individual differences in users (e.g. decision-making style) (*marketing-decision-maker variables*).

The results of the Minnesota Experiments thus make it clear that in order to make an (M)MSS effective, first optimal conditions have to be created which make it possible for decision-makers to use the information system in an easy way. The implementation of an MIS does not automatically increase its decision effectiveness. Optimal conditionsdiffer for different decision-makers, different problems and different decision-environments.

The attention of the Minnesota experiments was on the effects of technical characteristics of the IS on their effectiveness. The effects of the availability of DSS on the performance was studied by Sharda et al. (1988).

Sharda et al. (1988) review eleven laboratory studies which examine, among others, the effects of the availability of a DSS (*MMSS variable*) on decision-outcome variables (*performance variables*). The results of the reviewed studies were mixed. In six studies the performance increased for DSS users. In four studies no differences were detected between DSS users and non-DSS users. Finally, one study even showed lower performance for DSS users when compared with non-DSS users.

The review of Sharda focuses on the effects of only DSS. Benbasat and Nault (1990) review empirical studies on the use of three information technologies to support managerial activities: decision support systems (DSS), group decision support systems (GDSS), and expert systems (ES). They label these systems collectively as managerial support systems (MSS). Their review of empirical work for the years 1981-1988 is done on two major research themes, MSS design and the effects of use (availability) of MSS.

With respect to the effects of the availability of decision support systems Benbasat and Nault (1990) conclude that empirical investigations have been inconclusive. Some studies showed improved performance of decision-makers by means of using a DSS whereas in other studies there was no difference in performance between DSS using decision-makers and non-DSS using decision-makers. This finding is in accordance with the conclusion of Sharda et al. (1988) which is not surprising since their review was partly based on the same studies.

Concerning the performance effects of group decision support system availability they conclude that research into GDSS indicates that group decision-quality can be enhanced by a GDSS. In no study did GDSS reduce the decision-quality. At the time of their review, Benbasat and Nault (1990) had not found studies on the effects of the availability of expert systems. The studies focused solely on the design of ES.

Empirical Research on Marketing Management Support Systems

We now turn to empirical studies on the use and effectiveness of MMSS for the purpose of *marketing* decision-making. In Table 2-1, seven studies are systematically characterized. In this table the following characteristics are described for each study:

(1) The problem requiring decisions to be taken.
(2) The specific MMSS, used in the study, to support the decisions.
(3) The way the research was carried out (field experiment, laboratory experiment).
(4) The number and the type of subjects that participated in the research.
(5) The number of times the effects of the use of the MMSS were measured.
(6) The independent variables of which the effects were studied.
(7) The dependent variables that were measured.
(8) The results of the studies that were found.

We start with describing the seven studies in brief. After this the empirical research on the MMSS will be evaluated by describing the results of the systematical characterization (see Table 2-1).

Table 2-1 Empirical Studies on the Effectiveness of MMSS

Authors	Problem	Decision Aid	Research Approach	Subjects	Number of Measures
Fudge and Lodish (1977)	Making decisions about call frequency	CALLPLAN, an interactive management science model	Field experiment	20 "real-life" salesmen	One
Larréché (1979)	***	- FALLON, a data-analysis model based on regression - NIK2, a competitive bidding model	Laboratory experiment	MBA students	One
Chakravarti, Mitchell and Staelin (1979)	Making advertising decisions	ADBUDG, a decision-calculus model	Laboratory experiment	24 senior and middle level managers	Six periods
McIntyre (1982)	Brand Manager's Allocation Problem	Unlabelled decision-calculus model	Laboratory experiment	96 MBA students	Five periods

Table 2-1 (continued)

Authors	Problem	Decision Aid	Research Approach	Subjects	Number of Measures
Goslar, Green and Hughes (1986)	MAXIM case, a realistic, ill-structured marketing problem situation	A nonprocedural DSS generator (IFPS) used on an interactive basis to respond to subjects' requests. DSS offers opportunity to use data and models	Laboratory experiment	43 marketing executives	Six-day period
Zinkhan, Joachimsthaler and Kinnear (1987)	Decision-making in retailing	Computer simulation model	Laboratory experiment	205 part-time MBA students	One
Lodish, Cutis, Ness and Simpson (1988)	Deciding how large the sales force should be, and how it should be deployed	A series of subjectively parameterized models	Case study	One company	Three-year period

Authors	Independent Variables	Dependent Variables	Results
Fudge and Lodish (1977)	- Availability of CALLPLAN	- Percentage of Sales Change from prior year	- After six months the average CALLPLAN salesperson had 8.1% higher sales than his non-CALLPLAN counterpart
Larréché (1979)	- Integrative complexity of individuals - Level of environmental complexity generated by model	- Quantity of information searched for -Efficiency in search behaviour	- The more integratively complex an individual, the more he tends to search for information and the more efficient he is in his search behaviour - The effect of differences in integrative complexity on information search behaviour is greater for models that generate a level of environmental complexity closer to the optimum level for the group of individuals considered
Chakravarti, Mitchell and Staelin (1979)	- Availability of ADBUDG model	- Ratio of actual to optimal profits in each decision	- Use of ADBUDG model led to poorer decisions
McIntyre (1982)	- Model availability - Problem size - Noise level in environment - Effort - Mathematical ability - Cognitive style	- Decision outcome measures - Decision process measures - Decision conviction measures	- Well specified decision calculus models can be expected to improve unaided decisions, at least for problems that involve constrained budget allocations in simple stable environments. Size of the problem and the noise level in the environment have little interaction with these model benefits - Key individual differences in quantitative ability and cognitive style do not negate the expectation of model benefit - Participants felt more confident that their performance was good when using the model

Table 2-1 (continued)

Authors	Independent Variables	Dependent Variables	Results
Goslar, Green and Hughes (1986)	- DSS availability - DSS training - Data availability	- Number of alternatives considered - Period of time - Perceived confidence in decisions -Amount of data considered - Individual subject's decision processing - Overall performance	- Subjects without DSS training or availability considered more alternatives - No significant difference existed among the times required to finish decision-making in the experimental groups - No significant difference occurred in the amount of data considered across all experimental groups - None of the factors DSS availability, DSS training or data level significantly affected subjects' decision-making confidence, decision-making processes, or performance levels
Zinkhan, Joachimsthaler and Kinnear (1987)	- Risk aversion - Cognitive differentiation - Involvement - Managerial experience - DSS experience - Age	- Model assisted information search, use of the simulation model - User satisfaction	- Decision-maker's risk aversion (+), cognitive differentiation (+) and involvement (+) are determinants of computer-assisted information search - Information search (+) and age (-) are associated with user satisfaction (direction of influence in parentheses)
Lodish, Cutis, Ness and Simpson (1988)	- Availability of the models	- Sales	- Sales were 8 percent higher than they would have been if the status quo (no models) had continued - Management and research personnel realized how important the size and deployment of the sales force is to the strategic success of the company

Fudge and Lodish (1977) report a field experiment on the performance effects of CALLPLAN, an interactive management science model to support the planning of a salespersons account-call frequency schedule. The availability of CALLPLAN, an *MMSS* variable, was manipulated systematically. Two groups, each consisting of ten salespersons, were created. One group, with the CALLPLAN-model at their disposal, and a control group without the CALLPLAN-model. As a *performance* variable for both groups, the percentage of sales change was measured. After six months the average CALLPLAN salesperson had 8.1% higher sales then his non-CALLPLAN counterpart. The performance thus increased as a result of the availability of the CALLPLAN model.

Larréché (1979) reports the results of a laboratory experiment in which he investigated the influence of the cognitive style variable "integrative complexity of individuals", a *marketing decision-maker* variable, and the level of environmental complexity generated by marketing models, an *MMSS* variable, on the way the marketing model is used, as *MMSS-use* variable. Participants in the research were MBA students. Integrative complexity,

defined as the ability of an individual for integrating dimensions in a complex fashion, was treated as a covariate in this study.

Larréché (1979) found that integratively more complex individuals searched for more information and searched for it more efficiently. The environmental complexity generated by the model, operationalized here as the output format, the response time and the realism and educational value of the models, was also treated as a covariate. An interaction effect appeared between MMSS variables and marketing-decision-maker variables. The effect of differences in integrative complexity on information search behaviour was greater for marketing models that generate a level of environmental complexity closer to the optimum level for the group of individuals considered, with integrative complex individuals searching for more information.

Chakravarti et al. (1979), in a laboratory experiment, investigated the effect of the use of the decision-calculus model ADBUDG, supporting advertising decisions. Two groups of marketing decision-makers were distinguished. One group which could use the model and a control group which could not use the model. Subjects in the experiment were 24 senior and middle level managers. The experiment indicated that the use of this model, an *MMSS* variable, did not improve the quality of decision-making, as *performance* measure, but may, in fact, lead to poorer decisions.

McIntyre (1982) also carried out a laboratory experiment in which he manipulated systematically the availability of a well-specified decision-calculus model, as an *MMSS* variable. Two other experimental variables were manipulated systematically, namely size of the problem as *marketing-problem* variable and noise level in the environment as *decision-environment* variable. Finally three *marketing-decision-maker* variables, were treated as covariates, namely the individual's effort, mathematical ability and cognitive style. A brand manager's allocation problem had to be solved by 96 MBA students in the various experimental groups and for each subject *performance* variables and *evaluation* variables were measured. The results indicated, in contradiction to the results of Chakravarti et al. (1979), that well specified decision-calculus models can be expected to improve unaided decisions, at least for problems that involve constrained budget allocations in simple stable environments. Size of the problem and the level of noise in the environment were found to have little interaction with these model benefits. Individual differences in quantitative ability and cognitive style did not negate the expectation of model benefit. With respect to the subjective performance measure "decision-confidence", it was found that participants felt more confident that their performance was good when using the model.

Goslar et al. (1986), in a laboratory experiment, investigated the effects of DSS availability, DSS training and data availability as systematically manipulated *MMSS* variables. Six dependent variables were measured: the

number of alternatives considered, the amount of data considered, the decision-making process and the performance level as *performance* variables, period of time as *time for decision* variable and decision-making confidence as *evaluation* variable. The participants in the research, 43 sales and marketing executives, had to solve a case which offered a generic marketing situation amenable to a broad range of decision-makers involved in marketing activities. Subjects, with a DSS available for use, could make data inquiries, develop and enhance decision-models, and receive output in a variety of formats. Goslar et al. report that subjects without a DSS or without DSS training considered more alternatives. None of the independent factors affected the decision-making time, the amount of data considered, the decision-making confidence, the decision-making process and the performance level.

Zinkhan, Joachimsthaler and Kinnear (1987) in a laboratory experiment looked at the effects of *marketing-decision-maker* variables (risk aversion, cognitive differentiation, experience with DSS, managerial experience age and involvement) on the use of a computer simulation model, as *MMSS-use* variable, and the user satisfaction with the model as *evaluation* variable. They found that managers averse to taking risks, managers who were higher in cognitive differentiation, and managers who were highly involved with the DSS, looked for more information. User satisfaction was negatively correlated with the age of the decision-maker and positively correlated with information search. The research of Zinkhan et al. (1987) is important because it gives insight in the factors explaining the use of an MMSS. Indirectly these factors can also be expected to influence the performance of decision-makers who have an MMSS at their disposal.

Lodish et al. (1988) report, in a case study, the results of the use, as *MMSS* variable, of a series of subjectively parameterized models for deciding on how large the sales force in a pharmaceutical company should be, and how it should be deployed. Over a three-year period they report sales, as *performance* variable, which were eight percent higher than they would have been if the status quo (no use of the models) had continued. Another important result of the implementation and use of the models was the fact that management and research personnel realized how important the size and deployment of the sales force is to the strategic success of the company.

Evaluation

In this section we have reviewed empirical studies on the effectiveness of (marketing) management support systems. Research on (general) management support systems was briefly reviewed, while research on *marketing* management support systems was reviewed in more detail.

Seven studies on marketing management support systems were reviewed. Five of these studies focused on the effectiveness of MMSS, while two focused on the use of MMSS. Most of the studies took the form of experiments. The experimental laboratory approach was the most frequently used research method. In five of the seven studies on MMSS, this approach was used and in one study a field experiment was conducted. One study, finally, took the form of a case study.

The review shows that the use of (M)MSS does not unconditionally increase the effectiveness of decision-makers. The reviews of Sharda et al. (1988) and Benbasat and Nault (1990) show mixed results. Results of the five studies on the effects of the availability of the MMSS are also mixed. Three of the five studies report increased performance for marketing decision-makers using the MMSS. One study reports no difference between MMSS-using decision-makers and decision-makers not using MMSS. Finally, one study even reports poorer performance for the users of MMSS.

Three important explanations for these conflicting results may be: (1) the variety of tasks used across the different empirical studies (the problems in the seven studies on MMSS all differed from each other), (2) as a consequence of the variety of tasks the different decision-aids used across the different studies also differed from each other, and (3) the subjects in the different studies differed.

Furthermore, the empirical studies on MMSS show some limitations. The problems in de studies were relatively minor most of the time. Five of the seven problems were problems involving only one marketing-mix variable. For the other two problems, it was not clear on which variables decisions were made. So far, to our knowledge, no research on the effects of MMSS in a more complete marketing management environment has been reported.

As a consequence of the relatively small and varying problems, the MMSS studied, were also relatively small systems which all differed from each other. All seven MMSS studied, were model-based systems. Four of the seven models were decision-calculus models (Little, 1971) that were subjectively parameterized. Furthermore, in none of the studies did they investigate whether the effects of different MMSS in the same decision-environment showed variations. The effects of marketing knowledge-based systems have not been studied yet.

Jarvenpaa et al. (1985), in a comment on the conflicting results in (M)MSS research, state that many experiments have been highly simplistic and include only one kind of independent variable. Studies which have examined two or more variables and their interactions are almost nonexistent. In the studies on MMSS we reviewed a similar phenomenon appears. This means that not much insight is gained in the factors that influence the effectiveness. Most of the studies on the effectiveness and use of marketing management support systems take account of relatively few independent

variables. In five of the seven studies, the availability of the MMSS was studied as an independent variable. In three of these five studies, this was the *only* independent variable. In the other two, of the five, studies additional (mainly *marketing decision-maker*) variables were investigated in interaction with the MMSS availability. In two (of the seven) studies the availability of the MMSS was not manipulated systematically. All of the subjects in these two studies used an MMSS. These two studies focused on the effects of, mainly, individual characteristics on MMSS-using behaviour.

Not only was the number of independent variables investigated in most studies small the number of dependent variables was small too. In all of the five studies in which the availability of the MMSS was one of the independent variables, the performance of marketing decision-makers was measured as a dependent variable. In three of the five studies this was the only dependent variable that was investigated. In the two other studies other dependent variables were measured too. Examples of these dependent variables are decision-conviction and decision-process measures. In the two studies (of the seven), where availability of the MMSS was not investigated as an independent variable, the use of the MMSS (information search) was investigated. In none of the studies was both the actual use of the MMSS and the performance effects of this use investigated. This means that the relationship between the actual use of the MMSS and the performance was also never studied.

In four of the seven studies the dependent variables were measured only once. In three of the seven studies the dependent variables were measured a number of times. Franz and Robey (1987) make a distinction between *factor* and *process* studies on information systems. Factor research empirically examines user and situational attributes to see how they relate to outcome. Process research takes account of the fact that time affects the relationships between variables and that, changes over a period of time in one variable cause changes in other variables. Although in some studies the dependent variable was measured a number of times, the studies on marketing management support systems that were reviewed can all be conceived of as factor studies. None of the studies addressed the problem of whether processes appeared, meaning that changes in time in one variable caused changes in other variables.

Finally, the background of the subjects differs across the studies. Subjects were students (three of the seven studies) *or* professional marketers (four of the seven studies). In none of the studies did both students *and* professional marketers participate in one and the same decision-environment using one and the same MMSS.

From the above we can conclude that it still is not clear whether MMSS are effective and which factors influence this effectiveness in which way.

In the next section we describe the research model, we have used in our study on the effectiveness of MMSS. The findings of the review in this section had consequences for both the design of our study and our research model.

The model contains specific *MMSS variables* (not only one but several types of MMSS) but also variables that fit into the other classes of independent variables of the framework. Besides the main effects of the independent variables, the model also contains interaction effects between the *MMSS variables* and the other independent variables (to gain insight into the question what factors influence the actual effects of MMSS and in which way). Finally, the model contains specific dependent variables in all of the four classes as described in the framework, and relationships are specified between these dependent variables (to gain insight into the *process* of using an MMSS and the effects of this use on performance, and the factors which influence this process).

2.4 THE RESEARCH MODEL

This section is concerned with the research model we have used in this study. We shall describe both the specific variables (selected within the classes of variables in the research framework) and the expected relationships between these variables.

The research model is shown graphically in Figure 2-2. In this figure, the specific variables selected within the different classes of variables are presented.

Five dependent variables have been chosen: market share, decision-making time, the number of simulations made with the MDSS, the decision-confidence and the perceived usefulness of the MMSS. These variables are influenced by the *type of MMSS* the decision-makers have at their disposal. Other variables, that are expected to influence the dependent variables, are the *marketing decision-maker* variables: marketing decision-making experience, field dependence, and attitude towards MDSS-in-general. Furthermore, the *decision-environment* variable "time-pressure" is expected to influence the dependent variables. The *marketing-problem* variable in our model does not show systematical variation in our study. All subjects have to make the same marketing-mix decisions in a number of consecutive periods.

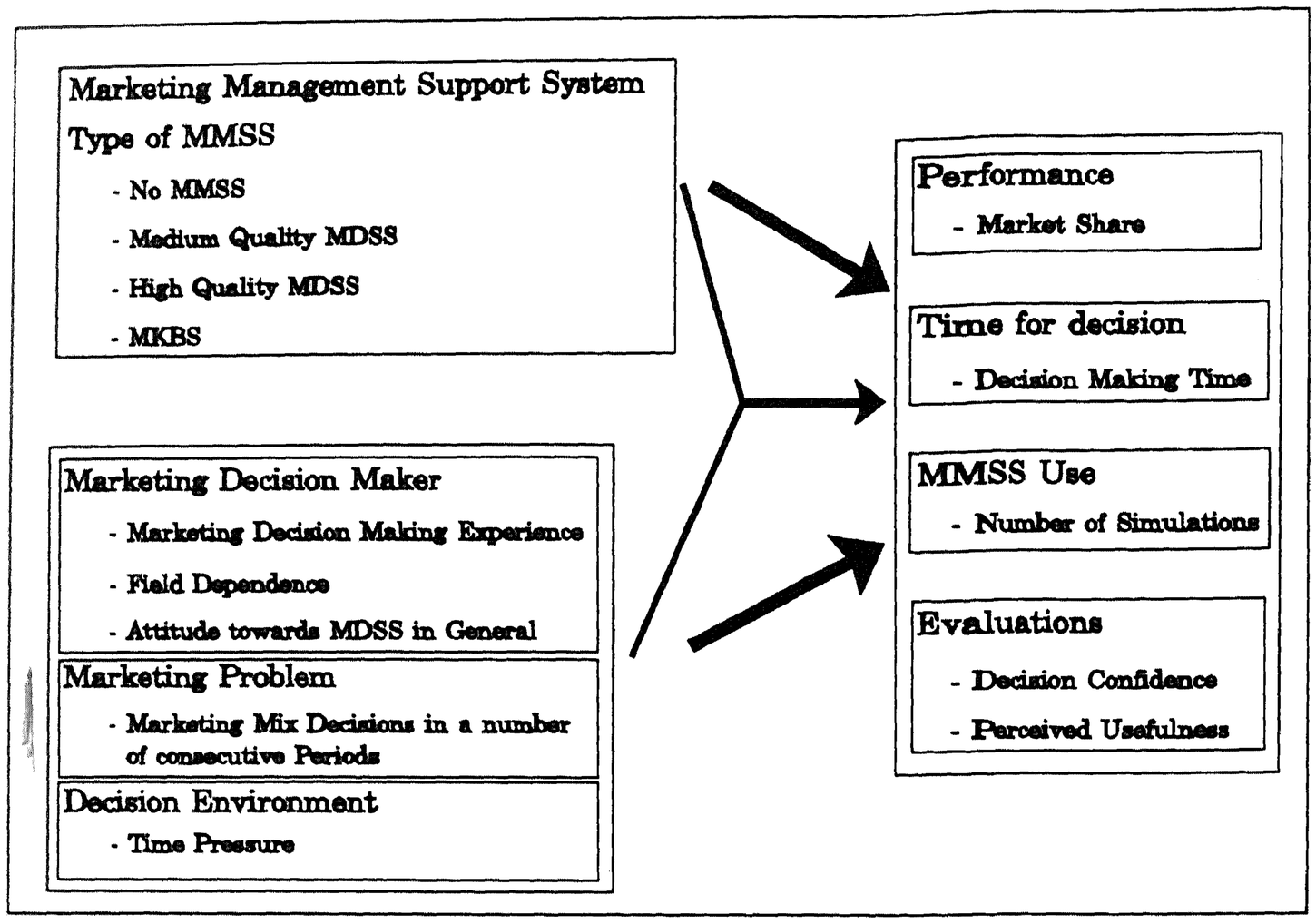

Figure 2-2 Model for Research on the Effectiveness of Marketing Management Support Systems used in this Study

Not only the direct effects of the independent variables are assumed, but also the interaction effects between the *MMSS variables* and the other independent variables. The effects of a certain type of MMSS are expected to be different for decision-makers with different characteristics and in different decision-environments.

In Figure 2-3 the relationships we expect between the five dependent variables are presented graphically. The number of simulations made with the MDSS, the *MMSS-use* variable, is expected to influence market share, the amount of decision-making time and decision-confidence. The market share a marketing decision-maker obtains, is expected to influence the number of simulations made in following periods. Finally, decision-confidence and perceived usefulness of the MMSS are also expected to influence the number of simulations made in following periods. The specific relationships are more elaborately described in § 2.4.1.

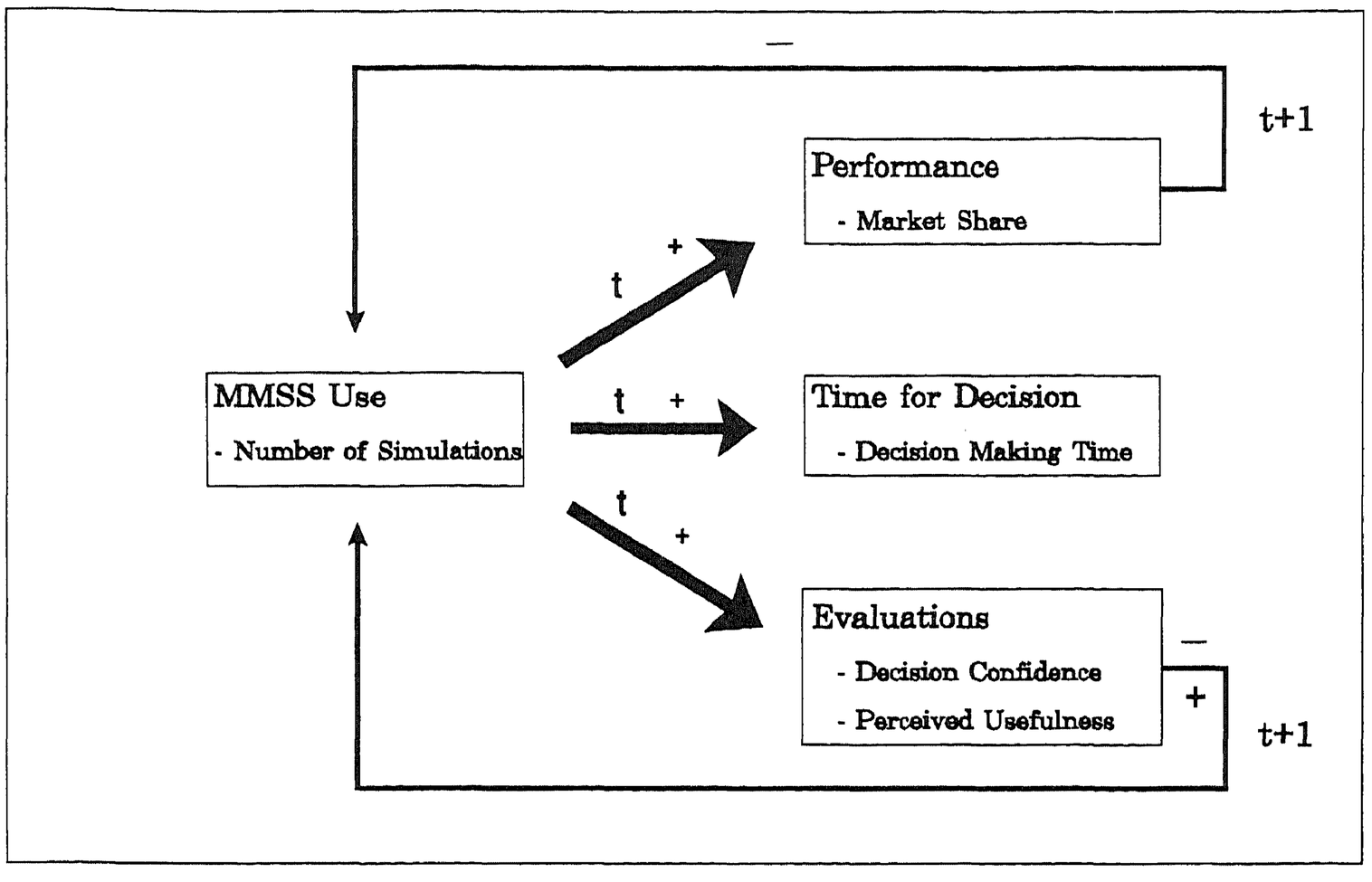

Figure 2-3 Relationships between dependent variables

Next, we describe the variables in our model and the relationships we propose between these variables.

2.4.1 The Dependent Variables

In this section the five specific dependent variables selected within the four classes of dependent variables (Figure 2-2 and 2-3), are described. Furthermore, relationships between these dependent variables are proposed.

PERFORMANCE

Market Share **(SHARE)** is selected as an objective performance variable. It would have been possible too, to select profit as performance-measure. As we will see in Section 4.2, in our study the values of profit and market share were very strong correlated. Therefore, the results of MMSS in our study will not differ very much for market share and profit. We assumed that for a company to be profitable at the long run, it is necessary to have a substantial market share. Buzell and Gale (1987), by analyzing the PIMS data base, found that under most circumstances enterprises that have achieved a large share of the market are considerably more profitable than their smaller-share rivals. Szymanski, Bharadwaj and Varadarajan (1993) performed a

meta-analysis on 276 market share-profitability findings from 48 studies to address whether market share and profitability are positively related. They find that, on average, market share has a significant and positive effect on business profits. Furthermore, in our study it was made clear to the subjects that besides the market share, profit was also important (for reasons which will be explained in Section 3.2). This implies that the subjects did not focus on market share alone.

The change in market share from period to period is expected to influence the number of simulations in following periods. Lucas (1975b,c) found low performance to cause an increase in the intensity of the use of a system. Here, we also expect a decreasing market share to cause an increasing number of simulations.

TIME FOR DECISION

Decision-Making Time (DMTIME) is selected as a time-for-decision variable. In a competitive environment it is not only important to look at the objective quality of a certain decision but also to look at the time needed to make the decision.

MMSS-USE

Number of Simulations made with the MDSS (SIMUL) is a measure of the intensity of using the MDSS. In most empirical research (see Section 2.3) the MMSS-use variable, as an independent variable, has been operationalized in terms of the availability of the MMSS. In this study the actual usage is measured as a continuous dependent variable, rather than as a dichotomous independent variable. This approach makes it possible, not only, to study factors which influence the usage of the MDSS but also to investigate the relationship between the actual MMSS-use and the performance.

We expect a marketing decision-maker, who makes more simulations, to obtain a higher market share. By making more simulations, the decision-maker is better able to design several alternative marketing decisions, to compare the different alternatives and, finally, to choose the best one from these alternatives. A higher number of simulations is also expected to cause more decision-making time. Furthermore, a higher number of simulations is expected to cause more decision-confidence. By making more simulations, the decision-makers are better able to design and weigh various alternative decisions. Since they know what the conditional outcomes of a large number of different decisions are, they will be more convinced that the decision they finally select is a good one. This will increase their decision confidence.

EVALUATIONS

Two evaluative variables are selected: decision-confidence and perceived usefulness of the MMSS.

Decision-Confidence (CONFIDENCE) The confidence of marketing decision-makers in their decisions can be conceived of as an evaluation of their own actions. Decision-Confidence is expected to influence MMSS-use: when decision-makers are not confident it is to be expected that they will make more simulations in the next period. They will look for more information to confirm the correctness of their decision.

Perceived Usefulness of the MMSS (USEFUL) concerns the evaluation of using the MMSS. Davis (1989) defined perceived usefulness as the degree to which a person believes that using a particular system would enhance his or her job performance. Perceived usefulness is found to be a major determinant of people's intention to use computers by Davis et al. (1989) and Adams et al. (1992). Based on these findings we expect USEFUL to influence the number of simulations in the next period. The more useful decision-makers perceive the MMSS, the more simulations they are expected to make.

2.4.2 The Marketing Management Support System Variable

Most of the research on the effectiveness of MMSS (see Section 2.3) investigated the effects of one type of MMSS for solving a particular marketing problem. Here we investigate the effects of three different MMSS. The *type-of-MMSS* variable has four levels: one level without MMSS and three types of a marketing management support system i.e., a high-quality MDSS, a medium-quality MDSS and an MKBS.

In this study, to answer the three research questions, three *contrasts* between the four levels of the *type-of-MMSS* variable are investigated. First, the performance of decision-makers using the high-quality MDSS is compared to the performance of unaided decision-makers. Second, the performance of decision-makers using the medium-quality MDSS is compared to the performance of users of the high-quality MDSS and to the performance of unaided decision-makers. Third, the performance of decision-makers using the MKBS is compared to unaided decision-makers. This way three variables are created which are described below.

Availability of the high-quality MDSS (HQMD) as the first MMSS variable has two levels, i.e. unaided and using the high-quality MDSS. The aim of marketing decision support systems is to increase the effectiveness of

a marketing decision-maker. Although results of studies on the effectiveness of MMSS are mixed, an MDSS should be expected to increase both the performance of marketing decision-makers and their decision-confidence because it offers decision-makers the possibility of extended information search. However, the search for more information will also cause more decision-making time.

Expected Effects

The availability of an MDSS is expected to increase the market share, the decision-making time, and the decision-confidence of a marketing decision-maker, when compared with a situation without an MMSS.

Quality of the MDSS (QLMD), as the second MMSS variable, has three levels, i.e. unaided, using the medium-quality MDSS and using the high-quality MDSS.

As reported in Section 2.3.2, all studies on the effects of MMSS focused on the effects of only one MMSS. The effects of the quality of the MMSS used has, to our knowledge, never been studied as an independent variable, by looking at the effects of different MMSS. We are interested here in the question of whether the results of using an MDSS are sensitive to the quality of this MDSS. Furthermore, we question whether users of a medium-quality MDSS still outperform unaided decision-makers.

The magnitude of performance effects, because of the use of an MDSS, is expected to be dependent on the quality of the MDSS. A higher quality MDSS is expected to result in a higher market share and more decision-confidence. A higher quality MDSS is also expected to be perceived as more useful and used more intensively. This increase in use will also cause more decision-making time.

The medium-quality MDSS used in this study (see Chapter Three) still makes fairly good predictions. Therefore we expect the users of that MDSS to still outperform unaided decision-makers.

Expected Effects

The availability of the high-quality MDSS is expected to result in a higher market share, more decision-making time and more decision-confidence than the availability of the medium-quality MDSS. The high-quality MDSS is also expected to be perceived as more useful and used more intensively than the medium-quality MDSS.

Users of the medium-quality MDSS are expected to obtain a higher market share, use more decision-making time and be more confident than marketing decision-makers not using any system at all.

Availability of the MKBS **(MKBS)**, as the third MMSS variable, has two levels, i.e. not using any MMSS at all and using the MKBS.

The MKBS to be used in this study, assists the marketing decision-makers in the *intelligence phase* (Simon, 1977) of the decision-making process with monitoring and diagnosing phenomena in the market. For this, the system will help the decision-makers to systematically analyse the market research data the decision-maker receive at each period. When changes in important variables, like the market share, appear, the system will perform a diagnosis on the market research data to help the decision-makers to find the cause(s) of these changes. This way, the decision-makers using such a system will be able to make decisions on a more solid basis.

The availability of the MKBS makes it possible for decision-makers to perform better and have more confidence in their decisions. However, the systematical analysis of the market research data will also result in more decision-making time.

Expected Effects

The availability of the MKBS will result in a higher market share, more decision-making time and more decision-confidence compared to a situation without an MMSS.

2.4.3 Marketing Decision-Maker Variables

Three marketing decision-maker variables have been selected to study whether they influence the relationship between the MMSS variables and the dependent variables, namely: marketing decision-making experience, field dependence and the attitude towards MDSS-in-general. These variables are described below.

Marketing Decision-Making Experience **(EXPE)** can be conceived of as important in the process of marketing decision-making. Perkins and Rao (1990) state that with experience, managers acquire expertise in making decisions. From this we conclude that it can be expected that the presence of this expertise influences both the way decisions are made, and the final decision itself.

We are interested in the question as to whether the use of MMSS can compensate for a lack of experience. Second, we question whether the availability of marketing decision-making experience influences the number of simulations made with the MMSS.

Research on the effects of expertise does not show unambiguous results. Some studies show results in favour of experts while other studies report no differences between experts and novices. Johnson (1988), after a literature review, concludes that the behaviourial decision literature does not present a flattering view of expert judgment. The superiority of experts to novices is often surprisingly small, or, in some cases, even nonexistent. Taylor (1975) found that the ability to diagnose the value of information was only slightly influenced by experience in decision-making. Johnson (1988) reports two empirical studies which examine expert performance and processes in two different domains. The first task was evaluating applicants for medical internships. The results of this research were: (1) the novices required almost twice as much time for the rating task than the experts. This was, in part, caused by the smaller amount of information examined by the experts; (2) the experts examined different information to the novices; (3) experts not only search for different information, they also have different patterns of search. By and large, the novices examine the information present in the folders the way it is presented. The experts search much more actively. Although marked differences appeared in the processes that were used by novices and experts in this task, these differences appeared to have a relatively small impact upon performance.

In a second study the task was predicting security prices. Results of this study were: (1) experts were again faster than novices; (2) differences appear in the information examined by experts and novices; (3) experts appear to focus upon fewer cues than do novices. Here, overall experts performed better than novices did. Neale and Northcraft (1986) in an experimental study on negotiating found some results which were also in favour of experts.

Results (Camerer and Johnson, 1989) of process analyses of experts shows: (1) search is contingent; (2) experts search less; and (3) experts use more knowledge.

Not included in the review of Johnson (1988) are the studies of Perkins and Rao (1990) and Avioli et al. (1990). Perkins and Rao (1990) found the effect of experience to be more pronounced in the less programmed decisions than in more programmed decisions. They also found that the effect of experience is manifested not only in the decisions themselves, but also in what information is used to make the decisions. Avolio et al. (1990) report a similar result.

So in less programmed situations, when the decisions are far from being automatic, experience is expected to have a more positive effect on performance than in more familiar, programmed problems. In the case of programmed decisions, experienced decision-makers seem to underestimate the difficulty of the situation and be more careless in making decisions. This results in faster but not always better decisions.

From the results of the studies on experience and expertise two major tendencies become clear. First, the way information is processed and decisions are made does differ between experts and novices with experts processing information more efficiently and being able to use knowledge in combining information. This is expected to have consequences for the way an MMSS is used, in particular for the intensity of the use.

Second, performance differences between experts and novices may be small, especially in well-structured tasks. In using MMSS, inexperienced marketing decision-makers, who do not have expertise, are also provided with the capability to systematically combine information. The MMSS contains the knowledge required for this. The inexperienced decision-makers are expected to perceive this capability as useful and benefit from it. This means that it is possible that an MMSS decreases the gap between experienced and inexperienced decision-makers.

Expected Effects

Experienced marketing decision-makers are expected to perform better, to use less decision-making time and to show more decision-confidence than inexperienced decision-makers. This difference between experienced and inexperienced decision-makers is expected to be smaller when they are aided by MMSS.

Furthermore, inexperienced marketing decision-makers, are expected to make more simulations and to perceive the MMSS as more useful than experienced marketing decision-makers.

Field Dependence **(FIDE)** is selected as a cognitive style variable. Witkin et al. (1971) define cognitive styles as the characteristic, self consistent modes of functioning which individuals show in their perceptual and intellectual activities. We are interested in the question of whether the use of an MMSS, as analytical decision-aid, requires certain analytical capabilities on the part of a decision-maker in order to use it effectively. It is also possible that an MMSS compensates for a lack of analytical capabilities, and helps especially non-analytical decision-makers. In this way the MMSS can decrease the performance-difference between analytical and non-analytical decision-makers.

Zmud (1979) notes that most MIS-related research has focused on three dimensions of the cognitive style construct. Hunt et al. (1989) state that evidence was found that the dimensions of cognitive style are not empirically independent. The first dimension is called the *single/complex* dimension. Bariff and Lusk (1977) refer to this dimension as cognitive complexity. This dimension pertains to structural characteristics of perception and thinking. The dimension is represented by (1) differentiation: the number of dimensions extracted from the data, and (2) integration: the number of interconnections between rules for combining structured data. The second dimension is the *field-dependent/field independent* dimension. This dimension (Bariff and Lusk, 1977) classifies individuals as perceiving data as either (1) patterns of data which are relatively independent of their context (field independent), or (2) discrete items embedded in their context (field dependent). The third dimension is the *systematic/heuristic* dimension. Bariff and Lusk (1977) refer to this dimension as the thinking mode. This dimension reflects whether an individual utilizes abstract models and systematic processes in cognition or whether the approach taken is based more on experience, common sense and the practicalities of a situation.

Witkin and Goodenough (1981) state that the field dependence – independence dimension has demonstrated breadth. What is basically at issue in this dimension is the extent of ability to overcome an embedding context. This ability, when developed, makes an analytical process of reasoning possible. This dimension of individual differences thus represents, at its extremes, contrasting ways of approaching a field, whether the field is immediately present or represented symbolically. It may therefore be designated as a global (field dependent) – versus – analytical (field independent) dimension of cognitive functioning (Witkin et al., 1971).

Huysmans (1970) states that the field dependent – field independent distinction can be made not only in perceptual situations, but extends to intellectual functioning as well. Huysmans distinguishes two "ways of reasoning": (1) Analytical reasoning. This type of reasoning reduces problem situations to a core set of underlying causal relationships. All effort is directed towards detecting these relationships and manipulating the decision variables in such a manner that some "optimal" equilibrium is reached with respect to the objectives; (2) Heuristic reasoning. This type of reasoning emphasizes workable solutions to total problem situations. The search is for analogies with familiar solved problems rather than for a system of underlying causal relationships which is often thought illusory. Common sense, intuition, and unquantified "feelings" about future developments play an important role in the extent to which they are applied to the totality of the situation as an organic whole, rather than as built up from clearly identifiable separate parts. Huysmans (1970) thus states that we deal with a continuum of which the ideal types, mentioned above, form the extremes.

Based on the above, it can be stated that the field dependent – field independent dimension thus discriminates between roughly spoken analytical (field independent) and non-analytical (field dependent) marketing decision-makers, both in the way they process information and in the way they make decisions.

Research by Benbasat and Dexter (1982) and Cole and Gaeth (1990) shows that analytical decision-makers can be expected to perform better than non-analytical decision-makers. We are interested here in the question as to whether the use of an MMSS changes this difference. McKenney and Keen (1974) state that a central factor determining whether a manager uses a model to reach a decision is the extent to which it "fits" his style of thinking. De Waele (1978) also states that it seems plausible to suggest that for anything to be called a decision-aid, it needs somehow to "fit" the manager's style. Here, however, the question arises: what does "fit" mean.

Since MMSS can best be viewed as analytical decision-aids, we can distinguish two possible roles for it:

(1) as *compensatory* to the lack of the decision-makers analytical capabilities; and
(2) as *reinforcing* the decision-makers analytical capabilities.

When performing a compensatory function, the MMSS especially helps non-analytical decision-makers because the MMSS compensates for their lack of analytical capabilities. When performing a reinforcing function, the MMSS especially helps analytical decision-makers because the MMSS supports (fits), and thus reinforces, the strongest function, which is the analytical one.

De Waele's (1978) investigations indicate that marketing managers prefer that kind of support which complements their weakest function, rather than an aid which helps their strongest function. Based on this we propose that the MMSS will have a compensatory function.

Expected Effects

Analytical marketing decision-makers are expected to perform better, to use more decision-making time and to show more decision-confidence than non-analytical marketing decision-makers. An MMSS is expected to compensate for a lack of analytical capabilities and therefore especially help non-analytical decision-makers. The difference between analytical and non-analytical decision-makers is therefore expected to be smaller for aided subjects than for unaided subjects.

Analytical subjects are expected to make more simulations with the MDSS and to perceive the MMSS as more useful than non-analytical decision-makers.

Attitude towards Marketing Decision Support Systems in general **(ATTI)** is selected because it is expected that this variable influences the way the MMSS is used (number of simulations made with the MDSS) and evaluated (perception of the usefulness of the MMSS).

In earlier empirical research on the relationship between attitudes and the use of computer systems, a number of significant relationships were found. Lucas (1975c) found that favourable user attitudes lead to high levels of use of an information system. Robey (1979) states that the overall conclusion one can derive from the Lucas and Schewe studies is that behaviour is related to users' feelings or beliefs about their systems.

Overall the research of Robey (1979), in a study of an industrial sales force, shows results which support the notion that user attitudes (or perceptions) are significantly correlated with system use. Attitudes are less powerful in predicting subjective assessments of perceived worth, although the relationships are significant.

Specific positive relationships have been demonstrated between specific user attitudes and the actual use of an MIS. However, as Robey states it does not necessarily follow that attitudes cause behaviour. Behaviour can also influence attitude formation. This means that the attitude can change as a result of using the MMSS.

Expected Effects

A positive attitude towards MDSS-in-general is expected to cause a higher number of simulations made with the MDSS. It is also expected to cause higher perceived usefulness of the MMSS.

2.4.4 The Marketing Problem

No specific marketing-problem variables are selected in this study. This means that no variation appears in this class of variables. We study the effects of MMSS in a marketing management environment. The MARKSTRAT environment (Larréché and Gatignon, 1990) is used for this purpose. MARKSTRAT has been described briefly in Chapter One and is described in detail in Chapter Three. Decisions in this environment have to be made on several marketing-mix variables in a number of consecutive periods. Results of the decisions are dependent on the main effect of the single marketing-mix variables, but also on interaction effects between these variables.

2.4.5 The Decision-Environment Variable

In this research one decision-environment variable is considered, i.e. the amount of time-pressure the decision-makers have to operate under.

Time-pressure **(TIPR)** is selected as decision-environment variable because it is expected that the degree of time-pressure influences both the decision-quality and the MMSS-usage. In general, marketing decision-makers have to work under an considerable amount of time-pressure which is caused by the availability of more and more marketing research data on a more frequent basis (for example as a result of the application of scanning technology). This makes it necessary to react more often and within shorter time intervals to phenomena in the market such as actions on the part of competitors. MMSS are supposed to increase the effectiveness of the decision-makers rather than the efficiency. It may be expected that the use of MMSS may cause even more decision-making time. So it can be questioned whether under high time-pressure an MMSS is still effective.

The degree of time-pressure is expected to influence the way decision-makers use information, the way they make decisions, and the final decision made. This is also expected to have consequences for the way an MMSS is used. Bronner (1973) states that decisions under time-pressure are characterized as those situations in which the amount of time does not suffice to find a solution to the particular problem at hand or to reach the most effective result possible. Rather the solution to a problem must be completed within a limited amount of time. There is not only an unspecified pressure for mental achievement, a secondary condition (limited time) plays a role as well. It is therefore justified to classify decision-making under time-pressure as behaviour under stress.

Time-pressure thus has two effects: first, a "physical" limitation of the information gathering and processing possibilities and second, a form of stress. This stress also affects the information gathering and processing possibilities. Kaufman and Lane (1991) state that what one does in the face of time-pressure may depend on one's perception of that pressure. If a subject perceives the situation as "not having enough hours", strategies may be investigated and chosen which enable a more efficient use and scheduling of obligatory activities. This means that the stress of marketing decision-makers is dependent on the degree of time-pressure they perceive. Wright (1974), in an experimental research on the evaluation of cars as purchase options, found high time-pressured subjects to attend to fewer dimensions. Rothstein (1986), after a literature review, concluded that time-pressure causes changes in judgment policy, which includes utilization of less infor-

mation and overall performance decrements. In an experimental study Rothstein also found time-pressured individuals to rely on fewer cues than nonpressured individuals.

We conclude that a higher degree of time-pressure will not only lead to less decision-making time but also to more stress. Both factors can be expected to cause a decrease in the performance of marketing decision-makers and fewer simulations made with the MDSS. This means that decision-makers are expected to benefit more from using an MMSS when working under low time-pressure than when working under high time-pressure because, under low time-pressure they are relatively free in making as many simulations as they want, to optimize their decisions Finally, higher stress because of higher time-pressure can also be expected to cause less decision-confidence.

Expected Effects

Marketing decision-makers working under low time-pressure are expected to perform better and to show more decision-confidence than decision-makers working under high time-pressure. Decision-makers are expected to benefit more (both market share and decision-confidence) from using an MMSS when working under low time-pressure than when working under high time-pressure.

Furthermore, marketing decision-makers are expected to make fewer simulations with the MDSS and perceive MMSS as less useful when working under high time-pressure than when working under low time-pressure.

Summary

In this chapter we have developed the research model to be used in our study. By testing relationships in this model we will answer the research questions as formulated in Chapter One. We started with the description of a general framework for research on the effectiveness of marketing management support systems. In this framework we proposed the performance of marketing decision-makers using an MMSS to be dependent on four sets of variables: (1) characteristics of the MMSS, (2) characteristics of the marketing decision-maker, (3) characteristics of the marketing problem, and (4) characteristics of the decision environment. Next, we reviewed both theoretical and empirical research, on the use and effectiveness of (M)MSS. Finally, based on findings from this review, specific variables within the framework have been selected. These variables have been described and relationships between them have been proposed.

In the next chapter we shall describe the operationalization of the variables in the research model. Furthermore, the designs of the three experiments, we performed to test the relationships in the research model, will also be described.