CHAPTER SEVEN

Conclusions, Discussion and Suggestions for Future Research

7.1 INTRODUCTION

In this study we investigated the effects of three different marketing management support systems (MMSS). The main focus was on whether MMSS could effectively support marketing decision-makers in their decision-making process. This decision-making process consists of three phases (Simon, 1977): firstly, searching the environment for conditions calling for decision (the intelligence phase), secondly, inventing, developing and analyzing possible courses of action (the design phase), and thirdly, selecting a particular course (the best) of action (the choice phase).

The first phase of the decision-making process, the intelligence phase, was supported by a marketing knowledge-based system (MKBS). For this aim, the MKBS performed qualitative analyses to detect changes in important variables and to find possible causes for these changes. Two other systems supported the design and the choice phase. These systems were marketing decision support systems (MDSS). These two systems only differed from one another in terms of their quality.

For each of the three types of marketing management support systems (MKBS, high-quality MDSS, and medium-quality MDSS respectively) we investigated whether they increased the performance of marketing decision-makers and, if so, under which conditions. For this we studied the effects of the MMSS on market share. Furthermore, the effects of the MMSS on the amount of decision-making time and on the decision-confidence were studied. With a select group of decision-makers with an MMSS at their disposal, we studied the factors which influenced its use, and the factors that influenced the perceived usefulness of these systems.

In this chapter we will not only discuss the most important results evolving from the research but also their implications for both its use in practice and for (future) research on MMSS. The structure of this chapter is as follows: we start in § 7.2 with summarizing the most important findings followed by conclusions based on these findings. Next, in § 7.3, the external validity of our study is discussed, to judge to what extent our findings can be generalized. In § 7.4, we discuss implications of our findings for the use in practice of MMSS. In § 7.5, the chapter draws to a close in a discussion on the implications of our findings for future research on MMSS.

7.2 MAJOR FINDINGS AND CONCLUSIONS

7.2.1 Introduction

With respect to the three marketing management support systems studied (high-quality MDSS, medium-quality MDSS and MKBS respectively), we formulated three main research questions:

1. whether the use of an MDSS increases the effectiveness of marketing decision-makers, and if so, under which conditions;
2. whether the effects of the use of an MDSS are dependent on its quality, and if so, under which conditions; and
3. whether the use of an MKBS increases the effectiveness of marketing decision-makers, and if so, under which conditions.

Besides the effectiveness of MMSS, in terms of market share, we also investigated the effects of MMSS on the amount of decision-making time and on two evaluations: decision confidence and the perceived usefulness of MMSS.

The research questions were studied within the framework of the conceptual model as proposed in Chapter Two (Figure 2-2), and as reprinted in Figure 7-1. In this model we assume that the performance of marketing decision-makers with an MMSS at their disposal is dependent on four sets of factors: (a) characteristics of the MMSS, (b) characteristics of the marketing decision-maker, (c) characteristics of the marketing problem, and (d) characteristics of the decision-environment. In each of the classes of variables in the model we selected specific variables (see Figure 7-1).

To answer the research questions our interest was primarily focused on the effects of the various types of MMSS, which is indicated by relationship I in Figure 7-1. Secondly, our attention was drawn to the question of whether the effects of the various types of MMSS differed for the different decision-makers and environmental conditions, as reflected by relationship II in Figure 7-1. This refers to the interaction between MMSS-variables and other independent variables. Although our main interest was in analysing the relationships I and II we, thirdly, also investigated the direct effects of variables relating to the decision-makers and the decision-environment as reflected by relationship III in Figure 7-1.

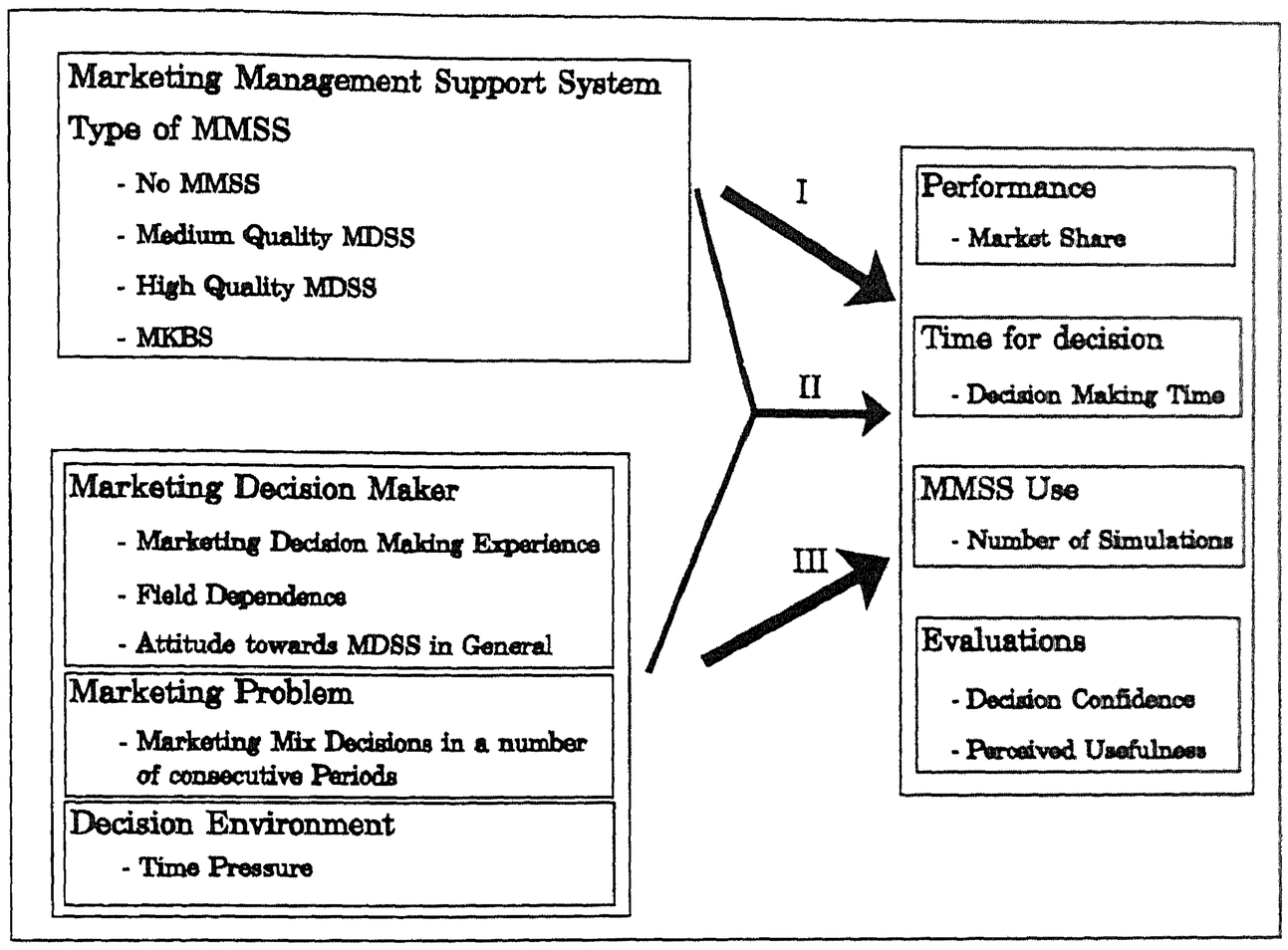

Figure 7-1 Research Model on the Effectiveness of Marketing Management Support Systems

The dependent variables could be categorized into objective (market share, decision-making time and number of simulations made with the MDSS) and subjective variables (decision confidence and perceived usefulness of the MMSS). The MMSS were expected to influence both the objective and the subjective variables. In the following, we will discuss these effects of MMSS. We will do this in a framework of questions which are formulated to gauge the effects of MMSS.

7.2.2 The Effectiveness of Marketing Management Support Systems

ARE MARKETING MANAGEMENT SUPPORT SYSTEMS EFFECTIVE?

We expected that decision-makers with an MMSS at their disposal would obtain a higher market share than unaided decision-makers. In conformity with our expectations the results of our research showed that both the users of the high-quality MDSS and the users of the medium-quality MDSS significantly outperformed the unaided decision-makers. The mean market share obtained by the unaided decision-makers was 18.4%. The medium-quality MDSS-using decision-makers obtained a market share which was

2.5 percentage-points higher, namely 20.9%. The market share of the high-quality MDSS-using decision-makers was 5.4 percentage-points higher than the market share of the unaided decision-makers, namely 23.8%. From these findings we conclude that providing decision-makers with an MDSS makes it possible for them to increase the market share, even when the quality of the MDSS is less than perfect.

When we look at the results of the decision-makers with the MKBS at their disposal, it appears that only in period 1 did they obtain a market share that was significantly higher than the market share of the unaided decision-makers. In the periods 2, 3, and 4, the market share of the MKBS-using decision-makers was higher than the share of the unaided decision-makers, however, this difference was not significant. So our MKBS was only significantly effective in the first period. Probably, this was caused by the fact that the MARKSTRAT environment was relatively well-structured. Only in period 1, when the environment was relatively new for the subjects, did the MKBS help the decision-makers to structure the environment, and only then was it significantly effective. In the later periods, apparently, decision-makers were able to structure the environment themselves at that stage. The MKBS no longer showed much added value.

Besides their effects on the market share, the MMSS were also expected to influence the amount of time needed to make a decision. For all three types of MMSS the increase in market share did indeed arise at the cost of more decision-making time. The average increase in the amount of decision-making time was 6% (1.5 minutes), 8% (2 minutes) and 13% (3 minutes) for the MKBS, the medium-quality MDSS and the high-quality MDSS respectively, when compared to the amount of decision-making time used by the unaided decision-makers.

DO DIFFERENT TYPES OF MMSS DIFFER IN EFFECTIVENESS?

We expected that the high-quality MDSS would be more effective than the medium-quality MDSS. This was confirmed by the results: the decision-makers using the high-quality MDSS significantly outperformed the decision-makers with the medium-quality MDSS. The market share of the decision-makers with the high-quality MDSS at their disposal was 2.9 percentage-points higher than the market share of the decision-makers using the medium-quality MDSS (23.8% vs. 20.9%). From these findings we conclude that the quality of the MDSS is a determinant of its effectiveness.

One might question whether the differences in performance come from the quality of the MDSS as such, or from the frequency with which the systems are used. We expected that a more intensive use of a system would result in a higher level of effectiveness. The results showed that differences in the number of simulations made with the medium-quality MDSS and the high-

quality MDSS existed. Users of the medium-quality MDSS made more simulations in period 1, while users of the high-quality MDSS made more simulations in period 3 and 4. This means that it is impossible to state unconditionally that one of the two types of MDSS was used more intensively than the other type. Since the performance of the users of the high-quality MDSS was better in all of the four periods, differences between the performance of the users of the medium-quality MDSS and the users of the high-quality MDSS can not be explained completely by differences in the use of the system. In period 1 the difference in market share must have been caused by the quality of the MDSS as such, while in periods 3 and 4 the number of simulations might also have been a cause.

Finally, we compared the performance of the decision-makers using the MKBS with the performance of decision-makers using one of the two types of MDSS. The results showed that the market share of the decision-makers with the MKBS at their disposal (19.7%) was lower than the market shares of both the decision-makers with the medium-quality MDSS (20.9%) at their disposal and the decision-makers with the high-quality MDSS at their disposal (23.8%). However, only the difference in market share between the users of the high-quality MDSS and the users of the MKBS was significant. Probably, the MARKSTRAT world is so well-structured that a system which supports intelligence activities is not as effective as a system for fine-tuning the decisions.

From our findings we can thus conclude that the high-quality MDSS is more effective than the medium-quality MDSS and the MKBS, while the market share of the users of the medium-quality MDSS is higher than that of the decision-makers using the MKBS. However, this last difference is not significant. Since the MKBS in our study was a rather simple system, in future research the question of whether more advanced marketing knowledge based systems are effective should be studied. In Section 7.5 we shall discuss this issue in more detail.

DOES THE MARKETING DECISION-MAKING EXPERIENCE OF THE DECISION-MAKERS INFLUENCE THE EFFECTIVENESS OF MDSS?

Experienced decision-makers were expected to obtain a higher market share than inexperienced decision-makers. Furthermore, we expected that the availability of MDSS could compensate for a lack of marketing decision-making experience and in such a way decrease the difference between the experienced and the inexperienced decision-makers.

Contrary to our expectations, we found that inexperienced decision-makers outperform experienced decision-makers, rather than the other way around. This meant that there was no need for the MDSS to compensate for a gap caused by a lack of experience. When looking at the advantage

decision-makers took of using the MDSS, we found that inexperienced and experienced decision-makers benefitted equally from using the system. The superior performance of inexperienced decision-makers relative to the performance of experienced decision-makers was therefore not changed by the availability of the MDSS.

Although performance differences between inexperienced and experienced decision-makers as a consequence of using the MDSS did not appear, we did detect differences between inexperienced and experienced decision-makers when we examined the way the systems were used. With respect to the actual use of the MDSS, experienced decision-makers seemed to be better able to make the right simulations than the inexperienced decision-makers. We conclude this from the fact that, in the later rounds, the experienced decision-makers made fewer simulations than the inexperienced decision-makers. Experienced decision-makers were thus able to increase their market share by the same amount as the inexperienced decision-makers, but at the cost of fewer simulations. Here the effect of experience seems to be manifested in the choice of *what* information to use when making a decision. The experienced decision-makers probably were better able to ask the right questions. They were more experienced in the procedure of searching information. This finding confirms the research of Camerer and Johnson (1989) who noted that experienced decision-makers use more knowledge in their information-search activities. As a consequence of using this knowledge the amount of information searched for will be smaller.

Thus the effectiveness of MDSS is not dependent on marketing decision-making experience. However, it does influence the way MDSS are used in the sense that experienced decision-makers use the MDSS more efficiently.

DO THE ANALYTICAL ABILITIES OF THE DECISION-MAKERS INFLUENCE THE EFFECTIVENESS OF MMSS?

An important question for us was whether the availability of an MMSS could compensate for a lack of analytical abilities and thus be especially helpful for non-analytical decision-makers. An alternative hypothesis could be, that in order to be able to benefit at all from an MMSS, the analytical abilities of decision-makers should exceed a threshold. In that case, the non-analytical decision-makers would not profit by the MMSS.

The influence of the analytical abilities was investigated for users of the high-quality MDSS. Overall, analytical marketing decision-makers were found to obtain a higher market share than non-analytical decision-makers. The results were different for inexperienced and experienced decision-makers. In the case of the inexperienced decision-makers, the MDSS played a *compensatory* role because it decreased the difference between non-analytical and analytical decision-makers. For the experienced decision-

makers the MDSS played a *reinforcing* role. In their case, the analytical, rather than the non-analytical, decision-makers benefitted most from the availability of the MDSS and the MDSS thus increased the difference between analytical and non-analytical decision-makers.

To explain the difference in MDSS-effects between the inexperienced and the experienced decision-makers, contingent upon analytical abilities, we proposed that an MDSS was able to compensate for a lack of analytical abilities, but in order for such an effect to appear, a minimum level of analytical abilities was required. The results showed that the non-analytical experienced decision-makers did not benefit as much from the availability of the MDSS as the analytical experienced decision-makers did. Probably, this was because the analytical abilities of the non-analytical experienced decision-makers were below the minimum level[26]. The non-analytical inexperienced decision-makers benefitted greatly from the availability of the MDSS, if compared to the analytical inexperienced decision-makers. Apparently, in their case, the MDSS could compensate for a lack of analytical abilities because their analytical abilities were above the threshold. Based on the results of our study we can propose that the level of the threshold must lie between a score of 39.42 and 51.51 on the Embedded Figures Test. Apparently decision-makers with a score above this threshold did not have enough analytical abilities to benefit from the MDSS.

We can thus conclude that the analytical abilities of the decision-makers do influence the effectiveness of the MDSS.

DOES THE DEGREE OF TIME-PRESSURE INFLUENCE THE EFFECTIVENESS OF AN MMSS?

We were interested in the question whether the degree of time-pressure would influence the effectiveness of MMSS. We expected that decision-makers would especially benefit from the availability of MMSS under low

26 The scores on the Embedded Figures Test (EFT) for the four categories of decision-makers are presented in the following table. Both within the group of inexperienced decision-makers and within the group of experienced decision-makers a group of non-analytical and a group of analytical decision-makers was distinguished by performing a median split. In this table high scores stand for low analytical abilities and vice versa.

	non-analytical	analytical
inexperienced	1. 39.42 (13.19)	3. 18.43 (5.25)
experienced	2. 51.51 (17.02)	4. 18.89 (7.28)

standard deviation in parentheses

The difference in EFT score between group 3 and group 4 is not significant (p=0.745). The differences between group 4 and group 1 (p=0.000) and group 2 and group 1 (p=0.001) are significant.

time-pressure conditions because more time offered the possibility to fully exploit the opportunities which the systems offered.

The effect of time-pressure on the effectiveness of the high-quality MDSS differed for inexperienced and experienced decision-makers. In the case of the inexperienced decision-makers the expected effect appeared: inexperienced decision-makers took more advantage of the availability of the system under low time-pressure than under high time-pressure. Under low time-pressure they could make more simulations and therefore benefit more from the system. The results of the experienced decision-makers were opposite to our expectations. Experienced decision-makers with the MDSS at their disposal were found to take more advantage of it under high time-pressure than under low time-pressure. Relative to the inexperienced MDSS-using decision-makers, experienced decision-makers with the MDSS at their disposal thus suffered less from a higher degree of time-pressure.

In order to explain the results presented above a closer look at the use of the MDSS was taken. Under high time-pressure all decision-makers made fewer simulations with the MDSS than under low time-pressure. As already reported, experienced decision-makers were able to obtain a certain increase in their market share at the cost of fewer simulations when compared to their inexperienced counterparts. They were probably more capable of making the right simulations. This may explain why under high time-pressure, when fewer simulations could be made, the market share of the experienced decision-makers did not show such a decrease as the market share of the inexperienced MDSS-using decision-makers.

So far, we showed that time-pressure had a negative effect on the market share of the users of the high-quality MDSS. Also a negative effect of time-pressure, but smaller, showed up for the users of the medium-quality MDSS. Their decrease in market share due to more time-pressure was equal to the decrease in market share of unaided decision-makers. In the case of the MKBS, however, the decrease in market share caused by a higher degree of time-pressure was not statistically significant. This, notwithstanding the fact, that the results of the decision-makers working under low time-pressure were better than the results of the decision-makers working under high time-pressure. This lack of statistical significance was probably related to the relatively low number of users of the MKBS of which the data could be analysed because of the small sample size (n=80). This weakened the power of the statistical test.

We found that decision-makers with the medium-quality MDSS and the MKBS at their disposal did not suffer more from a higher degree of time-pressure than the unaided decision-makers. The (inexperienced) users of the high-quality MDSS did suffer more from a higher degree of time-pressure than the unaided decision-makers. A possible explanation for this finding is that the medium-quality MDSS and the MKBS did not offer as many

opportunities for increasing the market share as did the high-quality MDSS. Therefore, users of these two systems did not lose so much of their market share when working under a higher time-pressure.

7.2.3 Effects of MMSS on evaluations

Besides the objective performance measures, we also studied the effects of the MMSS on two subjective evaluation variables, i.e. decision-confidence and perceived usefulness of the MMSS. The confidence decision-makers showed in their decisions can be conceived of as an evaluation of the decisions made. The perceived usefulness of the MMSS can be conceived of as an evaluation, by its users, of the usefulness of MMSS for improving the quality of decision-making. The perceived usefulness of MMSS could only be studied for decision-makers with an MMSS at their disposal.

DO MMSS INCREASE THE DECISION CONFIDENCE OF DECISION-MAKERS?

We expected that the availability of MMSS would increase the confidence decision-makers showed in their decisions because these systems offered them the opportunity to prepare their decisions more extensively. However, the results showed small, and mostly insignificant effects of the availability of MMSS on decision-confidence. Users of the medium-quality MDSS and users of the MKBS were not found to show significantly more decision-confidence than their unaided counterparts. For the high-quality MDSS the following was found: decision-makers using this system showed more decision-confidence than their unaided counterparts only in period 4. In fact, in period 2, users of the high-quality MDSS even showed a little less confidence than the unaided decision-makers. Apparently, for the decision-makers with the MDSS at their disposal it took three periods with positive results before it caused an increase in decision-confidence. McIntyre (1982) also found that models, which do increase the effectiveness, do not engender better understanding of market response. Thus providing decision-makers with a decision-aid does not automatically increase decision-confidence even if this decision-aid causes an increase in the effectiveness, as did the high-quality MDSS.

It may be concluded that the availability of MMSS has only a small effect on the evaluation of the decisions which were made. Only the users of the high-quality MDSS obtained a little more decision-confidence in period 4 when compared to the unaided decision-makers.

DO DIFFERENT TYPES OF MMSS CAUSE DIFFERENT EVALUATIONS?

We expected that the users of the high-quality MDSS would be more confident than the users of the medium-quality MDSS. Furthermore, we expected that the high-quality MDSS would be perceived as more useful than the medium-quality MDSS.

The results showed no significant influence of the quality of the MDSS on decision-confidence. This is not surprising as the availability of MMSS was not found to be an important determinant of decision-confidence. As seen before, the high-quality MDSS was capable of increasing decision-confidence only a little after a number of periods of using it. Therefore, the quality of the MDSS also did not influence decision-confidence.

Furthermore, our results showed that, contrary to our expectations, decision-makers perceived the medium-quality MDSS and the high-quality MDSS as equally useful. Finding no difference in perceived usefulness might be explained by the fact that decision-makers were not informed about the predictive power of the systems. As a consequence, probably both types of systems were relatively "black-boxes" for the decision-makers. One might speculate that only if decision-makers were able to gain experience in working with the systems so that they were no longer black-boxes, then the perceived usefulness of the high-quality MDSS might be expected to increase relative to that of the medium-quality MDSS. The results of our study did not show such change in the perceived usefulness between period 2 and period 4. Perhaps, in this experiment, the length of time spent working with the system (on average 94 minutes) was too short for the black box to be revealed.

With respect to the effect of the MKBS on decision-confidence, the tendency was that decision-makers with the MKBS at their disposal showed more decision-confidence than decision-makers with one of the two types of MDSS at their disposal[27]. Since the MKBS assists the decision-makers in analysing the environment and diagnosing problems, it can be inferred from this finding that insight in the working of the market might be more important for building up decision-confidence than following the recommendations of a "black-box" simulation model even if the latter causes a higher increase of the market share.

With respect to the perceived usefulness of the MKBS we found that the MKBS was perceived as less useful than the two types of MDSS. Apparently, decision-makers recognized the fact that the MKBS used in this study offers fewer opportunities to improve the quality of their decisions.

---

27 As mentioned before, the number of subjects using the MKBS was small, which caused a smaller power of the statistical test, and therefore detecting significant differences was difficult.

A possible explanation for the fact that the difference in perceived usefulness between the two types of MDSS and the MKBS showed a direction different from the difference in decision confidence, was that we measured the usefulness of the systems for improving the quality of the decisions rather than for gaining insight in the working of the market. If we would have operationalized the perceived usefulness of the MKBS (USEFUL) as the usefulness for gaining insight in the working of the market, then the MKBS might have been perceived as more useful.

Users of the medium-quality MDSS and users of the high-quality MDSS thus do not differ in their evaluations. Both types of systems were perceived as useful (the mean USEFUL-score was 4.1 on a scale which showed a maximum value of 5.5) . The evaluations of the users of the MKBS do differ from the evaluations of the users of the two types of MDSS. They tend to show more confidence while they perceive the MKBS as less useful than the MDSS.

DOES MARKETING DECISION-MAKING EXPERIENCE INFLUENCE THE EVALUATIONS?

Overall, we expected that experienced decision-makers would show more decision-confidence than inexperienced decision-makers because they are more familiar with making marketing-mix decisions and therefore may feel more comfortable in doing so.

Our results showed that experienced decision-makers were indeed more confident than their inexperienced counterparts. We expected that the availability of the high-quality MDSS could compensate for this lack of experience which caused less confidence. The results indicate that the MDSS is not able to compensate for the lack of experience and therefore the difference between the inexperienced and the experienced decision-makers does not disappear as a result of using the MDSS. Thus experience seems to be a more important factor for building up decision-confidence than the availability of an MDSS.

With respect to the perceived usefulness of the MDSS we expected that inexperienced decision-makers would perceive the MDSS as more useful because it compensated for their lack of experience. However, our results showed no differences between inexperienced and experienced decision-makers. Both categories of decision-makers perceived the high-quality MDSS as equally useful for increasing decision-quality.

Experienced marketing decision-makers thus showed more decision-confidence than inexperienced decision-makers, while the two groups did not differ in their perception of the usefulness of the MDSS.

DO THE ANALYTICAL ABILITIES OF THE DECISION-MAKERS INFLUENCE THE EVALUATIONS?

Analytical decision-makers were expected to show more confidence in their decisions than non-analytical decision-makers. MMSS were expected to compensate for this difference because they provided non-analytical decision-makers with the opportunity to make decisions after being provided with a systematical analysis of information.

However, our results showed no difference in confidence between analytical and non-analytical decision-makers. Therefore, the MMSS did not have to compensate for any lack of confidence caused by a lack of analytical capabilities. The effect of the MMSS was the same for non-analytical and analytical decision-makers.

There was also no difference in the perceived usefulness of the three MMSS between non-analytical and analytical decision-makers. Non-analytical and analytical decision-makers perceived the systems as equally useful.

The analytical abilities of decision-makers are not found to influence evaluations.

DOES THE ATTITUDE TOWARDS MDSS-IN-GENERAL INFLUENCE THE EVALUATIONS OF MMSS?

We expected that decision-makers who showed a positive attitude towards marketing decision support systems in general, would also evaluate specific systems more positively than decision-makers with a less positive attitude.

In conformity with our expectations the attitude towards MDSS-in-general was found to be a very strong determinant of the perceived usefulness of the specific MDSS studied here. This effect was found for both the second and the fourth period. The perception of the usefulness of MMSS did not change as a result of experiences with it and was rather stable over the four periods.

Thus the attitude towards MDSS-in-general positively influences the evaluation of the MMSS.

DOES THE DEGREE OF TIME-PRESSURE INFLUENCE THE EVALUATIONS?

Decision-makers working under high time-pressure were expected to show less decision-confidence than decision-makers working under low time-pressure. Secondly, we expected that decision-makers would gain more decision-confidence from the help of the MMSS under low time-pressure than under high time-pressure because they would then be able to fully exploit the opportunities of the MMSS. The results showed that decision-makers who were working under high time-pressure did indeed show less

decision-confidence when compared with decision-makers working under high time-pressure, however, this effect was the same for decision-makers with an MMSS at their disposal as for the unaided decision-makers.

The high-quality MDSS and the MKBS were perceived as more *useful* under low time-pressure than under high time-pressure. However, only for the high-quality MDSS was this difference significant. Decision-makers using this system probably had the idea that they could benefit more from using the system under low time-pressure than under high time-pressure.

Thus the degree of time-pressure is found to influence both decision-confidence and the perceived usefulness of the MMSS.

7.2.4 Effects of Decision-Maker and Environmental Variables

In this section we describe the direct effects of the non-MMSS variables. Although the main focus of our study was on the effects of the MMSS-variables we also studied the direct effects of the decision-maker and decision-environment variables in order to be able to interpret the interaction between MMSS variables and non-MMSS variables. Furthermore, it was interesting in itself to study how the non-MMSS variables influenced the use of MMSS and in this way also influenced the effectiveness of MMSS.

WHAT IS THE EFFECT OF MARKETING DECISION-MAKING EXPERIENCE?

We were interested in the question whether marketing decision-making experience was important in making effective marketing decisions.

The results showed that experienced marketing decision-makers obtained a lower market share than their inexperienced counterparts. A possible explanation for this fact might have been that the experienced decision-makers, because of their experience, were more cautious in making decisions. This possible explanation can be supported by the finding of Perkins and Rao (1990) who found experienced decision-makers more conservative in their decision-making. A cautious way of decision-making was disadvantageous in our MARKSTRAT-environment. Furthermore, the analytical abilities of the experienced decision-makers were below those of the inexperienced decision-makers. This also negatively influenced the performance of the experienced decision-makers when compared to the inexperienced decision-makers.

Marketing decision-making experience did not influence the magnitude of the increase of the market share, caused by the availability of an MDSS. However, it did influence the actual use of the MDSS. Experienced decision-makers made fewer simulations than their inexperienced counterparts. Although they used the system differently from the inexperienced decision-

makers, experienced decision-makers did not perceive the MDSS as more useful than the inexperienced decision-makers did. Finally, experienced decision-makers, as expected, showed more decision-confidence than inexperienced decision-makers. The MDSS did not compensate for this difference.

Marketing decision-making experience, operationalized in this study as subjects with real-life marketing decision-making experience, did not improve the performance of marketing decision-makers; neither did it mediate the effects of the MDSS on the performance. Marketing decision-making experience, however, did influence the way the MDSS was used. Experienced decision-makers used the MDSS more efficiently: they obtained the same increase in market share as their inexperienced counterparts but at the cost of fewer simulations.

WHAT ARE THE EFFECTS OF THE ANALYTICAL CAPABILITIES OF THE MARKETING DECISION-MAKER?

Overall, analytical decision-makers performed better than non-analytical decision-makers. We hypothesized that the high-quality MDSS could decrease this difference when the analytical capabilities of the decision-makers exceeded a certain threshold level. With respect to the actual use of the MDSS we observed that analytical decision-makers made more simulations than their non-analytical counterparts. So probably the fit between the (analytical) nature of the MDSS and the decision-style of analytical decision-makers was better than the fit with the decision-style of non-analytical decision-makers. However, the superior fit did not automatically mean that the analytical decision-makers could benefit more.

Huber (1983), after an examination of the literature on the relationship between the cognitive style of information system (IS) users and the design of these systems, concludes that: (1) the currently available literature on cognitive styles is an unsatisfactory basis for deriving operational guidelines for MIS and DSS designs, and (2) further cognitive style research is unlikely to lead to operational guidelines for MIS and DSS designs. In our research it appears that the effectiveness of MMSS differs for decision-makers with different analytical capabilities. So, although it may be difficult or even impossible to design systems which fit perfectly with the cognitive style of decision-makers, one should take into account the effects of this variable. Our research indicates that MMSS can only be effective when the analytical capabilities of decision-makers exceed a certain threshold-level. When decision-makers' analytical capabilities are below this level, providing them with an MMSS may not be profitable.

WHAT IS THE EFFECT OF THE ATTITUDE OF MARKETING DECISION-MAKERS TOWARDS MDSS-IN-GENERAL?

Attitudes towards MDSS-in-general did not influence MDSS-using behaviour. The finding that a relationship between attitudes and behaviour was absent is not new. Ajzen and Fishbein (1980), for example, report a number of studies which did not find a relationship between attitudes and behaviour. An explanation for this as mentioned by them is that attitude is only one of the possible factors influencing behaviour. Schewe (1976), also working on management information systems, did not find a relationship between attitudes and system-usage behaviour. In the case of the number of simulations made with the MDSS, the quality of the MDSS, the marketing decision-making experience, the analytical abilities and the degree of time-pressure were found to be significant determinants of the use of the MDSS, while the attitude towards MDSS-in-general was not.

Although we did not study the relationship between the attitude towards MDSS-in-general and the adoption of these systems here, attitude might influence decisions on whether or not to adopt an MDSS more than decisions on the intensity of using these systems. Probably, since using the MDSS in our experiment did not cost anything, decision-makers who were provided with the MDSS, just used it. The intensity of the use was dependent on the factors mentioned above.

The general attitude did influence the perception of the usefulness of specific systems very strongly. In the case of all three MMSS studied, it appeared that decision-makers with a positive attitude towards MDSS-in-general also perceived the specific MMSS as more useful. Experiences with the specific system, and results obtained with it during the experiment, did not change the perceived usefulness.

WHAT IS THE EFFECT OF TIME-PRESSURE?

Our results showed that the availability of MMSS caused an increase in the required amount of decision-making time. Since we may expect that marketing decision-makers are operating under a considerable amount of time-pressure, we were interested in the question what influence a smaller amount of decision-making time would have on the results of using MMSS. Our study shows that when decision-makers benefit from the availability of MMSS under low time-pressure, they also do so under high time-pressure. In the case of the high-quality MDSS, the inexperienced decision-makers were not able to benefit as much as they did under low time-pressure, however they still obtained a higher market share when compared with their unaided counterparts.

Having discussed the main results of our study, our concern in the next section will be to discuss the external validity of our research.

7.3 EXTERNAL VALIDITY OF THE STUDY

In this study we used the experimental laboratory approach. As was described in Chapter Three, this method was opted for because it offers a number of substantial advantages; nevertheless, it has its drawbacks. One of the potential drawbacks of the experimental laboratory approach is its level of external validity. As Locke (1986) states: the laboratory experiment maximizes rigor of control and precision of measurement at a cost of system realism and of generalizability to behaviour in other settings. In this section the generalizability of our findings will be discussed.

Three major threats to the external validity of our study can be identified: (1) the experimental environment used, (2) the subjects that participated in our study, and (3) the MMSS used. The results of our research can be generalized to real-life marketing-mix decision situations to the extent that the experimental environment, the subjects, and the MMSS used, were representative for these real-life marketing-mix decision situations.

The following discussion concentrates on whether the factors identified above were a serious threat to the external validity of our study. For this we will compare the experimental environment, the subjects and the MMSS in our study with those in previous empirical studies on MMSS, as reviewed in Section 2.3.2. This way the external validity of our study can be judged relative to that of previous studies.

The Experimental Environment

As was shown in the review of the previous empirical studies on MMSS in in Section 2.3.2, the problems on which decisions had to be made were relatively minor. The problems involved only one marketing-mix variable most of the time. Our study measures the effectiveness of MMSS in a more complete marketing management environment. As an experimental environment, for carrying out our research, we choose for a management simulation game i.e. MARKSTRAT. Research by Kinnear and Klammer (1987) showed that managers working in diverse industries believed that the MARKSTRAT-environment does reflect a real environment, useful for teaching and research. In an evaluation of the experiment, subjects who participated in our study were enthusiastic about the environment and playing MARKSTRAT (see Section 3.5.3).

To know to which kind of situations we can generalize our findings we shall shortly characterize the MARKSTRAT environment we used. The

MARKSTRAT-environment can be characterized as a relatively well-structured environment in which decision-makers are responsible for making marketing-mix decisions for consumer durable goods. The relationships between marketing-mix efforts and results of these efforts do not change very rapidly over time. Furthermore, it is more or less clear for the decision-makers how they can influence their results by their marketing efforts. The MARKSTRAT-market is a growing market with a fixed number of competitors. To make the decisions, a number of market research studies were available for the decision-maker. These studies contain information about a number of variables like market shares, advertising expenditures and distribution efforts for the various brands in the market. By providing the decision-makers with the information, the market was made relatively transparent to them. The competitive behaviour can be characterized as rational and is in conformity with the principles of the Growth-Share Matrix of the Boston Consulting Group (Aaker, 1992): products with profit-potential were provided with more marketing support than less promising brands which were treated as cash-cows. The question in which way our results are dependent on the competitive behaviour of the other firms in the industry would be an interesting one to answer in future research. We propose that for less predictable markets it will be more difficult to very well predicting MDSS. However, as our results showed, even a not perfect predicting MDSS can be effective. Furthermore, in such cases MKBS seem to be suited.

All in all, we think that the MARKSTRAT environment used was a complete and realistic one relative to the environments used in the studies conducted so far.

The Subjects

In the studies on MMSS conducted so far, the background of the subjects differed across studies. Subjects were students *or* professional marketers. In our research both master-level students and professional marketing decision-makers participated as subjects. The professional decision-makers covered a wide range of educational and industrial backgrounds. In the study of Chakravarti et al (1979) "real-life" marketing decision-makers did not benefit from the availability of an MMSS whereas in McIntyre's study (1982) inexperienced decision-makers did benefit. Our results showed some differences in the effects of the MDSS between the students and the professional decision-makers. However, the most important main effects of the MDSS on the performance of the two categories of decision-makers were the same. Both groups of decision-makers became more effective by using the MDSS. Our research has therefore shown that professional marketing decision-makers, who have to work with these systems in practice, can

benefit from the availability of MDSS. Furthermore, it is important to note that the students, who participated in our research also increased their effectiveness by using the MDSS. These students will be the next generation of marketing decision-makers, and therefore their results are also important.

All in all, the marketing decision-makers who participated in our study covered a wide range of educational, professional and industrial backgrounds, especially when compared to the studies on MMSS conducted so far.

The Marketing Management Support Systems

Of course the results of using an MMSS will be dependent on the characteristics of that specific MMSS. We can question whether the MMSS we used in our studies are representative for MMSS which are used in practice or which can be developed for real-life situations. In the studies on MMSS conducted so far the effects of only one, and as a consequence of the simple problems, most of the time simple decision aid was studied. In our study the effects of two types of MDSS *and* an MKBS were studied. The two types of MDSS consisted of a data-base and a model-base. The model-base contained a number of econometric simulation models. The MKBS consisted of a number of rules for performing qualitative monitoring and diagnosing activities. However, it was a rather simple system. This may be the reason why the MKBS was not very effective. Probably, a more advanced MKBS would have had greater effects on the effectiveness of decision-makers.

Neither MDSS (van Campen et al, 1991) nor MKBS (Wierenga, 1992) have been widely adopted in real-life situations. However, it is our belief that MDSS, like the ones studied here, can be developed for real-life settings too if enough data of sufficient quality are available. Furthermore, an MKBS like the one studied here can also be developed for real-life settings because we may expect that for most markets, knowledge in the form of these relatively simple "if-then" rules is available. However, it is likely that MKBS developed for real life situations would be more advanced than our version.

All in all, in our view the MMSS we studied, although not used on a large scale yet, are not unrealistic and can be developed for real-life situations. Furthermore, in our opinion the systems were more complete than the systems studied so far.

In our study the effects of three MMSS were observed in a complete and realistic marketing environment in which both students and real-life decision-makers participated as subjects. We conclude that these factors provide our study, relative to the studies conducted so far, with a high level of external validity.

7.4 IMPLICATIONS FOR THE IMPLEMENTATION AND USE OF MMSS IN PRACTICE

From the results of our research, implications for the use of MMSS in real-life settings can be derived. In this section, the most important of these implications will be discussed.

The first implication of our results is that by the adoption of MDSS marketing decision-makers can increase their effectiveness. In real-life situations the decision whether or not to adopt an MDSS should be dependent on the likelihood of being able to develop simulation models which show a predictive power high enough to make it possible to obtain results that outweigh the costs of the MDSS[28]. The results of our study show that both the medium-quality MDSS and the high-quality MDSS were effective. However, the magnitude of the increase of the market share is dependent on the quality of the MDSS. The MDSS with a very high predictive power results in a larger increase of the market share than the MDSS with the medium-quality simulation models.

Marketing decision-makers need not necessarily be provided with systems for performing qualitative monitoring and diagnosing tasks when, in their case, the decision-environment is relatively well-structured. Our research shows that our MKBS was only effective in period 1. This is explained by the fact that in this period the decision-environment was relatively new and unstructured for the decision-makers. In such a situation the MKBS helps decision-makers to structure the situation. In later periods the MKBS was not significantly effective any longer. Apparently, decision-makers were then able themselves then to structure the situation themselves. It would be interesting to study whether an MKBS would be effective in more unstructured decision environments than the one used in our research. Since the MKBS can help decision-makers to structure the decision-environment they are operating in, another implication of the results of the MKBS

---

28 We can question whether the benefits of using MDSS do outweigh the costs. Moriarty and Swartz (1989) write that in the cases they have reviewed, sales increases from advanced marketing and sales information technology have ranged from 10% to more than 30%, and investment returns have often exceeded 100%. Research of van Campen et al (1991) shows that the median of the investment costs of MDSS in the Netherlands is Dfl. 200,000.-. Furthermore, the median of the maintenance costs is Dfl. 30,000.- each year. When we assume that the sales in Dutch market for CD-players are 265,000 CD-players a year, that the average price of these systems is Dfl. 450.- and that the profit margin for the manufacturer is 20% of the retail price, an increase of the market share of 0.96% would mean that additional revenues equal the costs (both investment and maintenance costs of an MDSS for one year).

is that it may be very useful to use MKBS as a tool for training new and inexperienced decision-makers. This way, they can discover relationships between the key variables in a market and will be able to become familiar with them very quickly.

The effectiveness of both experienced and inexperienced decision-makers can be increased by providing them with an MDSS. The results of our study show that the increase in market share caused by the availability of the high-quality MDSS is equal for inexperienced and experienced decision-makers. So an MDSS is also useful for experienced decision-makers even when used in addition to their marketing decision-making experience.

When providing decision-makers with MMSS one should take the analytical capabilities of the decision-maker into account. In the case of decision-makers with very low analytical capabilities, the benefits of the availability of an MMSS may be relatively small. The results of our study indicate that decision-makers with analytical capabilities below a certain threshold level may not be able to use an MMSS very effectively. This implies that some types of decision-makers should not be provided with MMSS or that in selecting personnel for making marketing-mix decisions one should take their analytical capabilities into account. These analytical capabilities should exceed a certain minimum threshold-level when they have to work with MMSS. On the basis of this study it is difficult to state precisely what minimum-level of analytical abilities is needed.

The finding of the strong influence of the attitude towards MDSS-in-general on the perceived usefulness of the MMSS, seems to be an important one. Although we did not study this issue here, in real-life situations the perceived usefulness of specific systems may be an important variable for the decision whether or not to adopt such a system. If this is the case, it is important for suppliers of MMSS to change attitudes towards MDSS-in-general. This should be done by, for example, showing the benefits of the use of MMSS to potential adopters.

The attitude towards MDSS-in-general, through its influence on the perceived usefulness, might thus influence decisions about the adoption of MMSS. Once the MDSS is adopted the actual using intensity will be dependent on the characteristics of the decision-makers and the environment they are operating in, rather than on their attitude. We found no significant relationship between the attitude towards MDSS-in-general and the number of simulations made with the MDSS.

Although the use of MMSS costs extra decision-making time when compared with an unaided situation, marketing decision-makers can also benefit from

MMSS in situations where only a small amount of decision-making time is available. Our research shows that under high time-pressure it is more difficult to fully exploit all the opportunities a system offers, so the difference between unaided and MMSS-using decision-makers may be smaller. However, we found that MMSS which were effective under low time-pressure to be effective under high time-pressure too.

In our study we see that the availability of MMSS causes larger changes in the values of the objective variables (market share, decision-making time and number of simulations made with the MDSS) than in the values of the subjective variables (decision-confidence and perceived usefulness of the MMSS). Thus subjects did not seem to form their evaluations on the basis of their objective results. To give an example: the high-quality MDSS is not perceived as more useful than the medium-quality MDSS. Furthermore, most of the time there is a lack of relationships between the objective and the subjective variables. This means that the objective MMSS-use behaviour and results of the decision-makers are not always in accordance with their subjective feelings. This is illustrated by the fact that there is no difference in the perceived usefulness of the medium-quality MDSS and the high-quality MDSS. However, when we look at the actual use of the systems, it appears that the high-quality system is used more intensively, although it takes some time before this effect appears.

Furthermore, the feelings of the decision-makers about the results of their decision-making are not in accordance with their objective results. This is illustrated by the fact that although users of the high-quality MDSS obtain the highest market shares, they do not show more decision-confidence than the decision-makers using the medium-quality MDSS or the MKBS. A possible explanation for this finding is that the subjects did not have a reference-situation. Maybe in a situation in which subjects were confronted with various levels of decision support, there would have been more cohesion between objective results and the evaluations of the decisions which were made.

Decisions on the adoption of systems may be dependent on the subjective feelings about these systems and about making decisions when using these systems. Therefore, negative subjective feelings may be a barrier for the further adoption of MMSS. To make the usefulness of MMSS clear to decision-makers they should be provided with information on the usefulness of this system and the opportunities it offers, especially when compared to a situation where decisions have to be made unaided. Gaining experience by only working with the system may not be enough to influence their perception of the usefulness of these systems and its effectiveness. Wierenga and Oude Ophuis (1993) also find communication to be important for the adoption of MDSS.

Even if decision-makers perceive a system as not very useful for improving the decision-quality, they can gain decision-confidence by using it. The system which is perceived as the least useful, the MKBS, tends to have the largest effect on decision-confidence. To build up decision-confidence a system that provides decision-makers with insight in the working of a market seems to be more effective than a so-called "black-box" system. This means that to make decision-makers confident they should not only be provided with very effective systems but the way the systems come to their recommendations should also be made clear to them.

7.5 IMPLICATIONS FOR FUTURE RESEARCH ON MMSS

In Chapter Two we reviewed a number of studies dealing with the effects of MMSS. This review showed that studies on the effectiveness of MMSS showed mixed results. Two of the most comprehensive and well-known studies were those of Chakravarti, Mitchell and Staelin (1979) and of McIntyre (1982). Chakravarti et al (1979) found, for 24 real-life marketing managers, that the use of a model may not improve decision-making but may, in fact, lead to poorer decisions. They stated that the cognitive abilities of managers should be considered in the model-building and implementation process. This way models and implementation procedures could be developed that build upon a manager's strengths and compensate for his weaknesses.

McIntyre (1982) concluded 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 (i.e. with negligible carryover-effects). Subjects in his study were 96 MBA students. Furthermore, he found it encouraging, that he could show that key individual differences in quantitative ability and cognitive style do not negate the expectation of model benefits for any category of users, at least among the tested subjects.

In this section we will discuss the new insights which have arisen from our study, in addition to the knowledge on the effects of MMSS which already existed. Furthermore, we will discuss a number of issues for future research.

Type of Marketing Management Support System

The main results of the studies of Chakravarti et al (1979) and McIntyre (1982) were conflicting. Where Chakravarti (1979) found the decision-model to cause worse performance when compared to unaided decision-makers, McIntyre reported better performance for users of the decision-model. Both studies, however, only studied the effects of one system. The results might

have been caused by the fact that the specific decision aid used in the study of McIntyre was better than the decision aid which was used in the study of Chakravarti et al. This was also an explanation which was given by Chakravarti, Mitchell and Staelin in 1981. Our study shows that the effectivity of a system will be very dependent on the type of system which is used.

We investigated the effects of the MKBS which supported the decision-makers in the intelligence phase, and the effects of the two MDSS which supported the decision-makers in the design and choice phase of the decision-making process (Simon, 1977). It appeared that the MKBS was only significantly effective in period 1, while the two MDSS were significantly effective in all four periods. We propose that the MKBS will be more helpful in less-structured situations than in well-structured situations. It will be interesting to test this hypothesis in future research.

When looking at the effects of the different MMSS on decision confidence, the MKBS tended to increase decision confidence more than the MDSS. We explained this by proposing that the MKBS was better able to clarify the working of the market to the decision-makers than the two types of MDSS were, notwithstanding the fact that the latter two caused a larger increase in the market share. In future research it would be interesting to study the effects of an MMSS which consisted of both a monitoring and a diagnosing component for supporting the intelligence phase *and* simulation models for supporting the design and the choice phase. Users of such an *integrated* system can start by performing intelligence activities using the MKBS, and after they have found problems and possible causes for these problems, carry out a number of simulations to design a marketing action. Probably, performing the intelligence activities in such a systematic way before making the simulations makes it possible to use the simulation models more efficiently since decision-makers may be better able to make the right simulations. This may be useful given the consequences of the presence of scanning technology. Scanning technology causes the availability of more and more marketing research data on a more frequent basis. This makes it necessary to react more often and within shorter time intervals to phenomena in the market.

Students vs. Real-Life Managers

The results of our study show that the conclusion of Johnson (1988), that the behavioural decision literature does not present a flattering view of expert judgment, is also in force for marketing decision-makers.

Based on the results of the two studies of Chakravarti et al (1979) and McIntyre (1982), one could ask whether the effects of the MMSS were dependent on the experience of the subjects. In the research of Chakravarti

et al (1979), experienced marketing decision-makers performed worse when using the model, while in the study of McIntyre (1982) MBA students increased their performance by using the model. Our research indicates that both experienced (in making "real-life" marketing decisions) and inexperienced decision-makers can benefit from using MMSS. However, they differ in the way they use it. For this reason, the difference in decision-making experience can not explain the conflicting results of the studies of Chakravarti et al (1979) and McIntyre (1982).

The findings in this study lead one to the question whether both students and real-life managers should participate in future research or whether students would suffice. We found that the effect of the MDSS on the performance did not differ significantly between students and experienced decision-makers. However, the two groups did differ with respect to the way the systems were used. Therefore, in future research both students and real-life managers should be studied as subjects when the process of using the MMSS is investigated. When only the effects of MMSS on performance are studied, it may be sufficient to only select students as subjects. However, the results of our study do not show clearly whether, for example, in a different decision environment this would still be the case. Therefore, if possible, both students and real-life managers should be studied.

Analytical Abilities

Chakravarti et al (1979, 1981) proposed a consideration of the cognitive abilities of managers in the model-building and implementation process. McIntyre (1982) studied this issue and reported that differences in cognitive style did not negate the expectation of model benefit for any category of users, at least among the tested subjects. In McIntyre's study these subjects were students.

In our study the analytical abilities of the decision-makers were found to have an effect on the effectiveness of MDSS. Experienced managers were studied as well as students. Overall, these experienced marketing decision-makers scored lower for analytical abilities than the students. Therefore, participation by the experienced subjects meant a larger differentiation of analytical abilities, when compared to a situation in which only inexperienced decision-makers would have participated. This allowed us to study the effects of MMSS for subjects over a wider range of analytical abilities. In conformity with the expectation of Chakravarti et al (1979) we found that the analytical abilities of decision-makers influence the effectiveness of MDSS. In the case of the inexperienced decision-makers, an MDSS was able to compensate for a lack of analytical abilities. In the case of the experienced decision-makers the non-analytical decision-makers were less able to benefit from the availability of the MDSS than the analytical decision-

makers. This finding was explained by hypothesizing that in order to compensate for a lack of analytical abilities of a decision-maker, these abilities should exceed a certain threshold level when using an MDSS. In future research this hypothesis should be tested. A possible approach to study this issue is to let subjects make decisions both unaided and with the help of MDSS. By doing so we can determine whether decision-makers with analytical capabilities below a certain level are less capable in improving their performance with the help of an MDSS than decision-makers who have analytical abilities which are above the threshold.

The Problem

With respect to the problem about which decisions had to be made, McIntyre (1982) stated that a decision-calculus model can be expected to improve unaided decisions, at least for problems in simple and stable environments. In most of the studies reviewed in Chapter Two the effects of MMSS for relatively simple problems were studied. The results of our study show that MMSS can also be effective in more complete and dynamic decision environments like MARKSTRAT.

In our MARKSTRAT-world the number of competitors was fixed. Furthermore, the competitive behaviour was relatively rational and predictable. In future research it will be interesting to study the effectiveness of MMSS in an environment in which the number of competitors and the competitive behaviour is less predictable. In such situations it might be more difficult to develop effective MMSS.

Decision Environment

To gain insight in the generalizability of our findings to other areas of marketing it would be interesting to repeat the investigations in a number of different decision environments. A possible new decision environment could be a retail setting. Because of the availability of scanning technology retailers can make use of data about for example marketing expenditures and sales. This provides them with the opportunity to develop marketing decision support systems to support them in making their (retail) marketing decisions. To study the effectiveness of MMSS in a retail setting it would be interesting to compare the performance of retailers using this kind of technology and retailers who do not. This kind of research could be conducted by means of a field experiment.

makers. This finding was explained by hypothesizing that in order to compensate for a lack of analytical abilities of a decision-maker, these abilities should exceed a certain threshold level when using an MDSS. In future research this hypothesis should be tested. A possible approach to study this issue is to let subjects make decisions both unaided and with the help of MDSS. By doing so we can determine whether decision-makers with analytical capabilities below a certain level are less capable in improving their performance with the help of an MDSS than decision-makers who have analytical abilities which are above the threshold.

The Problem

With respect to the problem about which decisions had to be made, McIntyre (1982) stated that a decision-calculus model can be expected to improve unaided decisions, at least for problems in simple and stable environments. In most of the studies reviewed in Chapter Two the effects of MMSS for relatively simple problems were studied. The results of our study show that MMSS can also be effective in more complete and dynamic decision environments like MARKSTRAT.

In our MARKSTRAT-world the number of competitors was fixed. Furthermore, the competitive behaviour was relatively rational and predictable. In future research it will be interesting to study the effectiveness of MMSS in an environment in which the number of competitors and the competitive behaviour is less predictable. In such situations it might be more difficult to develop effective MMSS.

Decision Environment

To gain insight in the generalizability of our findings to other areas of marketing it would be interesting to repeat the investigations in a number of different decision environments. A possible new decision environment could be a retail setting. Because of the availability of scanning technology retailers can make use of data about for example marketing expenditures and sales. This provides them with the opportunity to develop marketing decision support systems to support them in making their (retail) marketing decisions. To study the effectiveness of MMSS in a retail setting it would be interesting to compare the performance of retailers using this kind of technology and retailers who do not. This kind of research could be conducted by means of a field experiment.

Time-Pressure

In none of the studies on the effects of MMSS we reviewed, was the effect of the degree of time-pressure was studied. Our study shows that, although, for example, inexperienced decision-makers were better able to benefit from the high-quality MDSS under low time-pressure than under high time-pressure, under high time-pressure decision-makers can still benefit from the availability of MDSS. It was even found that the effectiveness of experienced decision-makers caused by the availability of an MDSS did not decrease at all under high time-pressure. This was probably caused by the fact that they were better able to make the right simulations when they could make fewer simulations because of high time-pressure.

In the case of the MKBS an interesting tendency appeared: the performance of the decision-makers using an MKBS decreased only a little as a result of high time-pressure. However, since the number of subjects we investigated was relatively small, we did not find significant differences. It would be interesting to investigate whether a system like the MKBS, which functioned as a kind of a checklist, would be able to help decision-makers to prevent a decrease of the market share because of high time-pressure. In future research on this issue we should increase the number of observations and maybe manipulate the degree of time-pressure more strongly.

Since the results of our study make it clear that the degree of time-pressure influences the effects of MMSS, in future research studying the effects of MMSS under high time-pressure alone will not be permissible. Doing this would be attractive because it would save experimental time.

A Process Approach

The results of our study showed that inexperienced and experienced decision-makers obtained the same increase in market share as a result of the availability of an MDSS but at the cost of overall fewer simulations. The experienced decision-makers were probably better able to make the right simulations. Users of the high-quality MDSS made more simulations than did the users of the medium-quality MDSS. Furthermore, it appeared that non-analytical decision-makers made fewer simulations than did the analytical decision-makers although this difference decreased over the four periods. Finally, it was shown that decision-makers working under high time-pressure made fewer simulations than the decision-makers working under low time-pressure.

Although we do know that there are differences in the number of simulations made with the MDSS between the different experimental groups we do not know how the actual simulating behaviour differs. It would be interesting to investigate in which way the MMSS-use behaviour

of the different experimental groups differs from each other. For this type of research it is not just a question of counting the number of simulations but also of looking at the different alternative decisions which are investigated. An analysis of the *process* of using MMSS should result in more insight in the way these systems are used and which information is used by different categories of decision-makers. Knowledge about this process could be useful for developing systems and training users. A possible method to collect data would be to ask the subjects to comment on the way they make decisions with the help of an MMSS. By means of protocol-analysis we could obtain information on the way using an MMSS influences the process of marketing decision-making.

Johnson (1988) and Camerer and Johnson (1989) reported differences in information search behaviour between experts and novices. We also found differences between these groups with respect to MDSS-using behaviour. Since experienced marketing decision-makers were able to increase their market share by the same amount as inexperienced decision-makers but at the cost of fewer simulations, insight in the way experienced decision-makers search for information could probably result in *heuristics* which can also be used by inexperienced decision-makers. The use of these heuristics may increase the efficiency of the MMSS-using behaviour of this last group of decision-makers.

A Within-Subject Design

Although we expected that systems that were more effective would also be perceived as more useful, this was not the case. Furthermore, although decision-makers using the MDSS were more effective than unaided decision-makers they hardly showed more decision-confidence. Probably, this lack of differences in the values of the subjective variables was caused by the fact that decision-makers did not have reference-points to judge the usefulness of the MMSS they had at their disposal. In our study subjects were provided with only one type of MMSS. It might be that differences in the values of the subjective variables will appear, in a research design in which one decision-makers are provided with different types of MMSS. When decision-makers, for example, first have the medium-quality MDSS at their disposal and after this the high-quality MDSS, a difference in the perceived usefulness of the two types of systems will probably show up. In the same way, in a design in which decision-makers first have to make decisions unaided and after this are provided with an MMSS, differences in decision-confidence will probably show up. So it will be interesting to study the effects of MMSS in a research design in which decision-makers are confronted with a number of different modes of decision support, to study whether this will lead to more substantial differences in the values of the

subjective variables. This way it will be possible to detect whether decision-makers can judge the usefulness of different MMSS which do differ in effectiveness.