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There have been many investigations into decision support systems and the range of benefits they can provide to an organisation. Despite the increased use of these systems in professional practice, there remains a lack of acceptance towards marketing decision models, with many managers resisting their full implementation. This paper presents results of a task designed to explore the extent to which decision models are understood. Although findings show low levels of understanding, it appears that relevant ability and skill can be learned. Educational programs could use the task to raise awareness of problems related to human misjudgment and to demonstrate to managers the usefulness of decision models as a tool to achieve superior performance.

Keywords

support, systems, increasing, managers, decision, marketing, acceptance

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Increasing Acceptance of Managers for the Use of Marketing Decision Support Systems

Danielle Stern
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Track 16 Strategic Marketing Issues

Abstract

There have been many investigations into decision support systems and the range of benefits they can provide to an organisation. Despite the increased use of these systems in professional practice, there remains a lack of acceptance towards marketing decision models, with many managers resisting their full implementation. This paper presents results of a task designed to explore the extent to which decision models are understood. Although findings show low levels of understanding, it appears that relevant ability and skill can be learned. Educational programs could use the task to raise awareness of problems related to human misjudgment and to demonstrate to managers the usefulness of decision models as a tool to achieve superior performance.

Introduction

Marketing decision models are now an integral part of Marketing Engineering and Management Science theories. These models provide a framework for understanding complex systems and provide opportunities to explore the possible consequences of alternative decisions, to conduct simulations and to display detailed and accurate representations of marketing phenomena (Childe 1997, Lilien and Rangaswamy 2003, Zoltners 1981). Advances in technology have led to the widespread use of marketing decision models in professional practice and the focus of research has shifted from the development of models and techniques to the implementation of these models within the company (Assad, Wasil and Lilien 1992).

Decision making research shows that many decision makers rely on experience, mental models or simple decision rules such as heuristics (Lawrence and O'Connor 1995). This type of decision process can occur without any real understanding of the system, hence mental models are now considered inadequate for decisions regarding complex and dynamic market behaviour (Lilien and Rangaswamy 2003). This is supported by consistent findings that performance on dynamic decision tasks is far from optimal, and that performance further deteriorates as the complexity of the system increases (Brehmer and Allard 1991, Diehl and Serman 1995, Mackinnon and Wearing 1985, Rapoport 1975).

The typical marketing professional using marketing decision models does not readily understand the formal mathematical models used by computer programs to calculate market response outcomes (Lilien and Rangaswamy 2003). Therefore the models themselves must be easy to understand in order to help managers understand the system and use the model as a decision making aid (Childe 1997). Graphical representations or diagrams are commonly used to describe and represent the characteristics of interest in the system under analysis as well as the results of the computations (Childe 1997, Lilien and Rangaswamy 2003, Parsons 1981, Saunders 1987). There is evidence to suggest that the use of graphical representations of dynamic systems may facilitate understanding of the system and performance (McGeorge and Burton 1989, Vincente 1996). Yet practitioners often display resistance towards the

acceptance and implementation of decision models that has stemmed from the personal stake involved, personal and situational variables, satisfaction with the model and the cognitive style of the user (Schultz and Henry 1981).

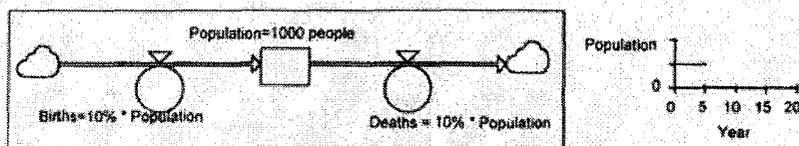
The successful use of decision models in professional practice depends upon the model user's integrative abilities (Zoltners 1981). However the deceptive simplicity of some models may give users a false sense of security, leading some users to ignore results and rely on their intuition or to accept results uncritically (Lilien and Rangaswamy 2003). This may be the result of a fundamental misunderstanding of the system. The ability to forecast the behaviour of dynamic systems and to correctly forecast the effects of changes to those systems is an integral part of dynamic decision-making tasks, and indicates a high level of understanding of the system. This study was particularly concerned with individual differences in forecasting ability to explore the extent to which decision models are understood.

Method

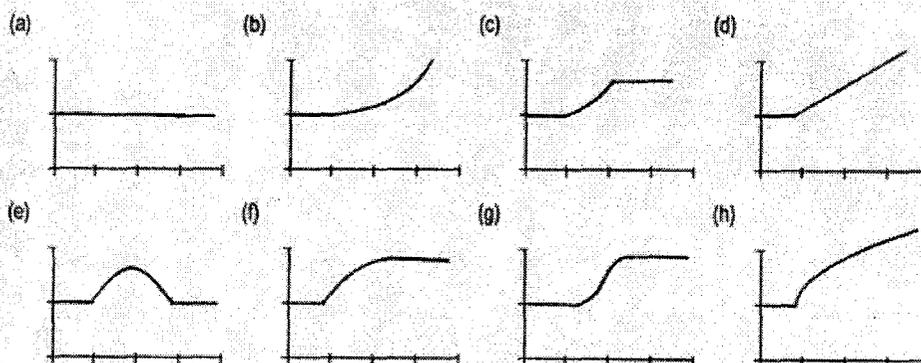
A forecasting task was created based upon a simple dynamic system, featuring non-linear growth and decay resulting from internal system feedback. The task consisted of 15 questions, with each question requiring a forecast of the effect of a given change to the system. The questionnaire began with an explanation of dynamic systems and the way in which they can be represented in diagrammatic form. A simple example of a dynamic system was explained, followed by an example of a more complex dynamic system involving feedback loops. This example described a population, where the inflow is births and the outflow is deaths. Both the rates of births and deaths are affected by the size of the population. The task utilised population forecasts, as they are readily understood by most people.

Each test item was accompanied by eight multiple choice response graphs indicating the shape of population growth or decline. Participants were required to forecast the future population by selecting the graph that correctly corresponded to the effect of the change to the system. The first five questions referred to the same system explored in the second practice example. This system and the first test item are shown in Figure 1 below.

Figure 1: Item One of the Forecasting Task

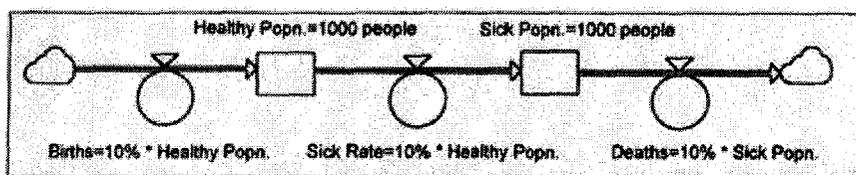


1. What will happen to the population if, in year 5, the rate of **deaths decreases to 5%** of the population as a result of advances in medical techniques?



The final five questions pertained to a more complex system that contained two populations, a healthy population and a sick population. This section began with an explanation of the new system as an extension of the earlier example, that people often become sick before they die. Hence the new system featured a birth rate into the healthy population, a sick rate from the healthy population into the sick population and then a death rate as shown in Figure 2 below. Participants responded to each test item by selecting one graph for each of these populations from the eight alternatives. Therefore the task required each participant to make 15 responses in total.

Figure 2: Healthy and Sick Population System Diagram in the Forecasting Task



The questionnaire was administered to 460 participants across three groups: high school students ($n=73$), first year university students ($n=347$) and third year university students ($n=40$). The first year university students were drawn from across various faculties and participated during their first semester of study. The third year students had completed at least one research methods subject during their university study. None of the participants had previously studied forecasting techniques or dynamic systems, hence all participants were considered novices with respect to the forecasting task. Testing was conducted in groups ranging from 2 to 24 participants. Respondents were instructed to read the introduction to the questionnaire and attempt the two practice questions, recording their answers on the answer sheet provided. Participants were advised to ask the experimenter for explanations of the practice questions to ensure that the instructions and systems had been understood. Twenty minutes was allowed for the completion of the questionnaire.

Results

The mean numbers of correct responses (and standard deviation) from the 15-item questionnaire were 6.43 (3.07), 5.05 (2.97) and 5.12 (3.12) for third year university students, first year university students and high school students respectively. Although the third year university students performed at a significantly higher level than the other groups across the entire questionnaire ($F=7.56$, $p=.006$), the total scores of school students did not appear to differ from the first year university students. The patterns of responses for the second system in the questionnaire showed that respondents correctly answered the questions relating to the healthy population at a higher rate than the questions relating to the sick population ($t=7.755$, $p=.000$). This was consistent with the increased complexity of the sick population forecasts and was apparent across all three samples.

The forecast for the healthy population required in one item of the task was identical to the second practice example, although participants were not explicitly informed of this similarity. Since the solution to this practice question was provided in the introduction to the questionnaire, this question acted as an indicator of understanding of the task. If participants had fully understood the instructions and practice items, this question should have been answered correctly. It was found that the third year university students correctly answered this question at a substantially higher rate (80%) than either the first year university students (55%) or the high school students (56%). This suggests that the high school and first year university students had a lower level of understanding of the model, in comparison to the third year university students.

An examination of the patterns of distraction showed that within questions regarding the healthy populations, participants tended to be drawn to particular alternatives, with many other alternatives being selected by none or very few participants. However, the response patterns for questions regarding the sick populations suggests participants were responding more randomly. The pattern of incorrect responses also provided an insight into the nature of the lack of understanding exhibited by first year university students and high school students. The correct answer to the repeated item was a graph of non-linear growth. The incorrect response chosen by many school students and first year university students was a graph of linear growth. This suggests that these students misunderstood a fundamental aspect of dynamic systems, namely system feedback resulting in non-linear growth or decay. By contrast, the most frequent alternative response to this item by third year university students was another graph of non-linear growth. This suggests that when third year university students made an error, it was not an error that indicated a fundamental lack of understanding of the dynamics of the system.

Discussion

This study provided insight into forecasting ability and initiated the development of an instrument to measure this ability. The task required the prediction of the effect of a change made to the system, and did not require the participant to produce an evaluation or a decision involving further cognitive processing. The task was identical for all participants and eliminated problems faced in previous studies due to the effects of the different decisions made by participants. The development of the task was also motivated by the need to isolate the components of dynamic tasks responsible for poor performance. Results indicated a low overall performance and poorer performance on items relating to the sick population, the most

complex aspect of the system. This suggests that a lack of understanding of the system contributes to the poor performance shown in studies of dynamic decision making.

Third year university students outperformed both first year university and high school students, indicating a higher level of task understanding and the existence of individual differences in dynamic forecasting ability. A possible explanation for the highest level of performance demonstrated by third year university students is the advantage provided by the completion of at least an additional two years study at university level, including a subject introducing research methods. This group is likely to have gained more experience with dynamic systems and to have encountered more opportunities to learn about and understand complex situations. These findings suggest that some component of forecasting ability can be learned, resulting in improved understanding of complex tasks. Higher levels of understanding would facilitate an increase in the level of skills and knowledge of marketers and managers, leading to improved workplace decisions.

A lack of understanding of complex systems and marketing decision models may help explain the low model acceptance rates and apparent dissatisfaction among the intended users. This has led some managers to ignore results suggested by marketing support systems, instead relying on intuition and mental models. The inadequacy of mental models and experience as decision making tools were among the initial reasons for the development of marketing decision models. Unfortunately, managers with a lack of understanding may not critically evaluate the results of analyses, preventing the organisation from receiving the full potential benefits offered by the model. The forecasting task examined here could be used to raise manager's awareness of the complexity of the task and that these difficulties may be avoided by implementing the decision support systems.

This study has important implications for training programs to educate managers with respect to complexity and interaction with marketing decision models. An exploration of the common errors made in this forecasting task uncovered a lack of understanding of system dynamics and system feedback among many respondents. Education programs could raise awareness and understanding of complex systems and demonstrate the potential advantages of model use. This knowledge may help overcome managerial resistance to the widespread use of decision models and promote additional benefits from the use of models in professional practice.

A potential limitation of this study is that the survey instrument may need revision with respect to the level of difficulty. The difference between performances of the sample groups also warrants further investigation. The forecasting task provided critical insight into performance on dynamic tasks, as the prediction of the next state of the system is essential for competent decision-making. The task could be further developed for use within training programs as a demonstrative tool or as an instrument to measure changes in levels of understanding as a training outcome. Future research could examine a variety of forecasts such as the forecast of marketing related phenomena, or investigate understanding of industry related complex systems such as inventory control in factories.

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