

# **Mental Models and Decision Making In a Dynamic Health Care Environment**

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## **ABSTRACT**

*Forty-two senior managers (20 MD trained and 22 MBA trained) from two large managed care organizations were asked to make a series of strategic business decisions in a simulated (and dynamic) health care environment (Risky Business – developed by High Performance Systems). One half of the managers in each group (MD and MBA) were given a stable environment, characterized by constant levels of competition and stable economic conditions. The other half were given a turbulent environment characterized by aggressive pricing and quality improvements by competitors plus changing economic conditions. Each manager in each group was asked to make decisions that maximized the goals of financial performance and quality of care. In the stable environment, eight of 21 managers (2 MDs and 6 MBAs) using primarily feedforward decision control strategies (Brehmer, 1990) were able to stay in business for the full 20-year period of simulated time. In the turbulent environment, two of 21 managers (1 MD and 1 MBA) using financial mental models, were able to stay in business for the 20 years of simulated time. Mental models (financially-focused, quality-focused, balanced) of both successful and unsuccessful managers constrained task performance depending upon the degree of turbulence and the control strategy employed.*

## **Background**

This research investigates the thinking of health care executives as they engage in a dynamic decision making task. Typically three factors have been shown to influence executive decision processes in dynamic environments: 1) mental models (Lane, 1999; Doyle et. al., 1998), 2) use of feedback/feedforward decision control strategies (Brehmer, 1990), and 3) changing (exogenous) conditions in the decision environment (Dörner, 1997). This study extends previous research by examining the relationship between each of these factors and task performance in the health care industry.

The US health care industry is characterized by constant pressures to improve both the quality of care delivered to patients as well as the financial performance of individual healthcare organizations. While some believe that an inherent tradeoff exists between quality of care and financial performance, healthcare organizations have been seeking ways to achieve both goals without sacrificing either (e.g. System Dynamics Review Special Issue on Health Care, 1999). Simulations, such as the one employed in this research, have been developed to aid senior executives from a variety of fields in making long term strategic decisions that simultaneously improve both the quality and the financial performance of organizations.

## Study Design

The research we report employed the iThink simulation, *Risky Business: Mastering the New Business of Health*, developed by High Performance Systems in cooperation with The Healthcare Forum, Breakthrough Learning, Inc., the 3M Foundation and twelve major U.S. managed healthcare organizations. The simulation was developed as a training tool for healthcare executives and was altered for research purposes (help facilities were removed and a new interface was developed to facilitate data collection).

The simulation was administered individually via laptop computer to forty-two senior healthcare managers (twenty MD trained and twenty-two MBA trained – no joint degree managers participated) from two large Midwestern integrated healthcare companies. The task of each study participant was to assume the role of a Chief Executive Officer (CEO) of an integrated<sup>1</sup> healthcare organization and make resource allocation decisions over a 20 year period of simulated time (using nine potential decision variables provided by the simulation, e.g. pricing, infrastructure investment). Participants were instructed to pursue the goal of maximizing their company's net income and customer satisfaction.

After entering their response on each decision variable for a given year, participants were given access to fifteen performance feedback items. In order to view a specific item (for example, customer satisfaction) participants had to select that item from an information board (Payne & Braunstein, 1978). The information board displayed information only when the item was selected (by using a mouse to click the on-screen button associated with each type of information).

The study design yielded three sources of data: 1) decisions made by each participant on the nine decision variables, as well as results on the fifteen feedback items for each year of simulated time, 2) a process trace created by a mouse-tracking program that provided a record of each piece of information as it was viewed (clicked on with a mouse) and how long each piece of information was viewed by a participant, 3) a demographic questionnaire that was administered to participants after the completion of the simulation.

Three performance outcomes were assessed: 1) Years in Business 2) Net Income and 3) Customer Satisfaction. Years in Business was calculated based on the number of years a participant was able to maintain a positive case balance. Net Income and Customer Satisfaction were provided by the *Risky Business* simulation based on the decisions made by each participant.

Two versions of the *Risky Business* simulation were developed - one representing a stable exogenous environment and another representing a turbulent exogenous environment. The stable and turbulent environments were the same in all respects, including the presence of four simulated competitors, except that over the twenty years of simulated time, the turbulent environment reflected: 1) increasing levels of service quality and decreasing prices by simulated competitors, 2) changing numbers of patients with insufficient resources to pay for their healthcare services, 3) changing capitation rates<sup>2</sup> and 4) a more rapidly aging patient population. Participants within each group were randomly assigned to one of these two versions of the simulation (10 MD Stable, 10 MD Turbulent, 11 MBA Stable and 11 MBA Turbulent). Three mental models (Financial, Quality of Care, and Balanced) and two Decision Control Strategies (Feedback and Feedforward) were assessed for each participant.

## Results

Ten of 42 participants (7 MBA's and 3 MD's) successfully completed all twenty years of the simulated task<sup>3</sup>. Of the 32 unsuccessful participants, ten exited by year seven (2 Turbulent MDs, 1 Stable MD, 5 Turbulent MBAs, 2 Stable MBAs). Among these ten, it was primarily the influence of extreme decisions in the first years that lead to their early departure. While the influence of turbulence generally speeded departure (7 of the 10 were in the turbulent environment), mental models and decision controls strategies were not significant distinguishing factors.

A second group of 18 unsuccessful participants (4 Turbulent MDs, 7 Stable MDs, 4 Turbulent MBAs, 3 Stable MBAs) were in business for 8 to 15 years. These 18 relied predominately on financial mental models (13 of the 18) and feedback control strategies (13 of the 18). While financial mental models were also characteristic of the ten successful participants, feedforward control (as opposed to feedback control) predominated among successful participants.

A third group of unsuccessful participants (3 Turbulent MDs and 1 Turbulent MBA) successfully negotiated the initial impacts of turbulence (they stayed in business for 16 to 18 years). As turbulent forces increased in later years, however, their reliance on a feedback control strategy (3 of the 4 used a feedback strategy) prevented them from preparing for an increasingly hostile competitive environment.

Figure 1 presents graphs of two participants who were unsuccessful in completing all twenty years of the simulation. The graph shows characteristic changes over time for the participants on the two performance measures of Net Income and Customer Satisfaction. The top graph shows an MBA participant in a stable environment who initially generates minor declines in performance but is able to show gains in year seven. While this MBA is able to avoid large fluctuations in performance, she generates small performance declines each year (negative percentage changes). By year thirteen, these initial small losses have compounded and the MBA goes out of business. This MBA used a financial mental model and a feedback control strategy.

The lower graph, for an MD in a stable environment, shows dramatic oscillations in performance which eventually become irreversible and lead to the MD's departure in year fifteen. This MD used a financial mental model and a feedback control strategy.

Figure 2 presents graphs for two of the ten successful participants (one MBA and one MD). Both of these participants generate fluctuations in performance over time, but avoid large variations (usually caused by frequent short-term increases and decreases in investments and pricing) in either performance measure and successfully complete the twenty years of simulated time. The MD used a financial mental model with a feedback control strategy while the MBA used a financial mental model with a feedforward control strategy.

Figure 3, summarizes the mental models and decision control strategies used by participants in stable and turbulent environments. Feedforward strategies were used by 70 percent (7 of 10) of successful participants (both environments combined) while only 34% (11 of 32) of unsuccessful participants used this strategy. Similarly, 70% (7 of 10) of the successful

participants employed a financial mental model (both environments combined) while only 59% (19 of 32) of the unsuccessful participants used this model.

Five successful (71%) participants with financial mental models used a feedforward control strategy while two successful (29%) participants with financial mental models used a feedback control strategy. In contrast, six (31%) of unsuccessful participants with financial mental models used a feedforward strategy while 13 (69%) used a feedback strategy. Thus the successful participants tended to use a financial mental model with a feedforward decision control strategy while unsuccessful participants who used a financial mental model did so in combination with a feedback decision control strategy.

### **Conclusion**

Our results suggest that MDs who have entered management positions within healthcare organizations appear to shift their mental models away from the quality of patient care to the financial viability of organizations when making strategic decisions. This shift has positive performance implications. MBAs, who already prefer financial mental models, shift from feedback to feedforward decision control strategies in order to achieve high levels of performance.

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<sup>1</sup> Within the healthcare industry, an integrated organization is one that includes hospitals, clinics and some form of insurance plan within a single organizational structure.

<sup>2</sup> Capitation refers to a payment method whereby healthcare providers are reimbursed a fixed payment per month per patient. Increasing capitation shifts the management for risk away from healthplans and onto healthcare providers and can therefore influence major strategic decisions such as capital spending.

<sup>3</sup> Participants were judged to have "gone out of business" in the decision year in which their cash balance dropped below zero.

## References

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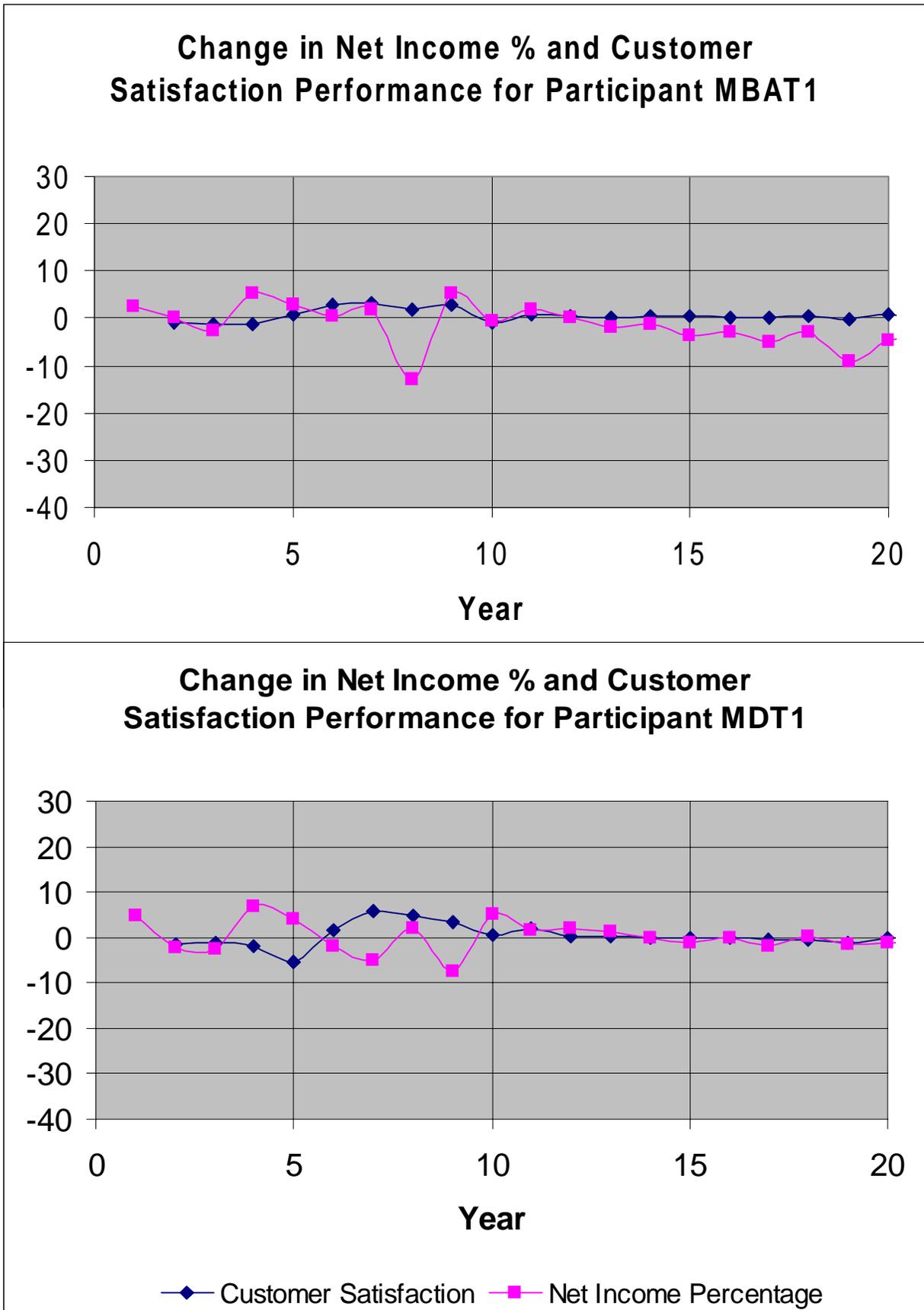
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Figure 1 - Performance of Two Unsuccessful Participants



Figure 2 - Performance of Two Successful Participants



**FIGURE THREE**

