IMPLEMENTING A MARKOV-BASED ACCOUNTS RECEIVABLE DSS: A PROTOTYPING APPROACH

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A microcomputer was used to develop a prototype DSS for a Markov-based accounts receivable problem. The DSS was developed for and used by decision makers in a U.S. distribution center for religious articles. Analysis and evaluation of the application reveals that the use of the microcomputer-based DSS helps end users understand the use and decision value of the information provided by Markov analysis, enables decision scientists to demonstrate the usefulness of their methodologies, and helps analysts successfully prototype models on a microcomputer before transferring them to larger systems.

When a decision scientist suggests a new decision support methodology, the management information systems (MIS) group is often left to implement it. Implementing a change in the way decisions are supported and made can be met with significant resistance by managers or end-users. Indeed, recent research has shown that in some organizations employees actively try to sabotage software innovations to resist their implementation (Barton, 1987). This resistance can pose problems when decision scientists or systems analysts try to convince an organization’s management of the benefits of incorporating new decision models into their current systems. Resistance comes about for many reasons. In some cases it occurs because the decision scientists do not do an adequate job of presenting the benefits of the new methodology (Tingley, 1987). In other situations management simply does not want to incur implementation costs such as:

1. manager’s time spent learning new software,
2. manager’s time spent understanding new output,
3. possible downtime of the mainframe to install the new package, and
4. manager’s time spent developing the new package.

Ideally users will participate actively in all stages of systems development. The reality is that many users have little time for helping consultants...
or specialists develop software systems. For instance, most U.S. managers “learn-while-doing” or learn how to use software while trying to make profits for their organization. A successful implementation strategy for software should not only save managers the implementation costs, but should also permit them to be active participants in the development of the software. Active participation in systems development helps convince management of the merits of new methodologies.

This paper focuses on an approach that can be used to bridge the gap between introducing a new decision science methodology and successfully incorporating it into daily practice. This paper illustrates how a prototyped microcomputer-based decision support system (DSS) was used to ensure adoption of a management science model. Specifically, this paper is a case study of how a prototype DSS was used to implement a Markovian decision science model in an accounts receivable department of a national clothing distribution operation. Benefits reported by end users and system developers are also presented.

**Case Background**

The North American Youth Ministries (NAYM) Distribution Center of Lincoln, Nebraska is a major international distribution operation for uniforms and ceremonial clothing for religious groups. They also distribute educational arts and crafts activities kits. During the mid 1980s NAYM merged with a California company, thereby changing from a regional to an international distributor rapidly. Dramatic changes were made in its operations location, staffing, and operating systems.

One of the problem areas that surfaced during this period of time was the organization’s accounts receivable which were tying up a considerable amount of the organization’s funds. The information collected and provided to management on accounts receivable could be characterized as “descriptive” at best. The accounts receivable were grouped into four overdue accounts payment categories of 30 days, 60 days, 90 days and 120 days overdue. Daily transactions (i.e. receipts and disbursements) were tracked via an accounts receivable module on the mainframe and a descriptive monthly report on the current status of customer accounts and dollar values that fell in each of the four categories was then provided. No projections or forecasts of the number of accounts or their dollar value amounts were given. The rapid growth which NAYM underwent in the distribution center during the mid 1980s placed considerable pressure on the financial aspects of the operation. As a result of this financial pressure, the management of NAYM sought to tighten their control of sources of funds, such as accounts receivable.

**Accounts Receivable Planning**

Using Markov analysis for accounts receivable planning is well documented in the literature (Barkman, 1981; Clec & Icerman, 1980) and basic management science textbooks (Lee, Moore & Taylor, 1990 and Rubin & Stinson, 1986). As described in Lee, et al, the analysis requires the construction of a transition matrix \( P \) where:

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P = \begin{bmatrix} I & 0 \\ R & Q \end{bmatrix}
\]

\( (1) \)

\( I = \) an identity matrix
\( 0 = \) a matrix of zeros
\( R = \) a matrix containing the transition probabilities of being absorbed in the next period (i.e. being an account that is paid up or, alternatively, being recognized as a bad debt)
\( Q = \) a square matrix containing probabilities for movement among all nonabsorbing states (i.e. accounts that are 30, 60, 90 or 120 days overdue).