Decision making involves a number of environments and factors. Individuals bring their own value systems to bear and are able to identify their preferences without much difficulty. They may not be able to explain precisely why they prefer one solution over another, but they usually know what they want.

The decision problem generally becomes more complicated and elusive as the number of attributes characterizing the problem and the objectives to be met increases. Furthermore, group decision making introduces certain fuzziness about the characteristics of the “right” answer. Identifying member opinions and unifying them into a consensus are additional elements of the decision-making process. Group Decision Support systems (GDSS) are a specialized type of computer-based business information systems which lead to better decisions, increase participation by group members, and reduce group domination by a vocal minority.

The case reported in this paper examines how a company\(^2\) has made use of a GDSS to assist its managers in the decision-making process for the procurement of a Local Area Network (LAN).

Since its inception in the early 1980s, the local area network (LAN Technology) has proven to be one of the most effective tools for solving communication problems. However, the task of configuring the optimal LAN for a certain application remains a difficult one, given the large number of components contained by the communication network. The decision making process requires technical skills, financial savvy, as well as considerable knowledge about a dynamic commercial market. This paper describes a Decision Support System based on the Analytic Hierarchy Process (AHP) methodology to assist managers in the decision-making process for the procurement of a Local Area Network (LAN).

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Background

The Metropolitan Auto Transport Authority (MATA) was—and is—a nonprofit organization involved in the transportation business in a metropolitan area of approximately half a million people. At the time of the study the agency employed an administrative staff of 35, including a seven-member MIS department and over 200 transport operators. MATA used several transaction processing systems as well as management information systems to oversee its operational and management control, as well as its strategic planning. MATA’s...
hardware facilities included a set of 25 IBM and Macintosh personal computers, a set of 12 printers from different manufacturers, and an IBM AS400 computer.

**The Problem**

At the time of the study, data and hardware were shared only via the “Nike” method, that is, users copied data onto floppy diskettes and physically carried the diskettes to other devices. In order to facilitate the administrative function of the company and to provide a greater accessibility and shareability of the data, MATA decided to integrate each of the independent workstations into a Local Area Network.

The selection of a local area network is a complex problem which involves many criteria and alternatives. While some of the criteria involve the use of quantitative data, others require qualitative judgments by functional experts. In the specific case, the decision group included the MIS Department manager, the lead systems analyst (acting as the future LAN manager), and an external network consultant. The goal of the decision group was to identify a decision criterion which would lead to a synthesis of the qualitative and quantitative inputs from the members into an overall recommended course of action. Time was of the essence.

**Analysis**

There were several constrains to be considered in building the model used during the evaluation process. For instance, the model had to be able to combine both quantitative and subjective assessments of the objectives; facilitate organizational communication by clearly explaining the factors considered in the decision process and the relative importance assigned to each factor; build consensus among the members of the decision group; speed up the decision process. The Analytic Hierarchy Process appeared to be one of the most promising tools to accomplish the task at hand.

Indeed, the Analytic Hierarchy Process (AHP) developed by Saaty (Saaty, 1980) has proven to be very useful in assisting the decision maker’s selection. It has been used as means of aiding multiobjective choice (Zahedi 1986; Shim 1989; Karni 1990, for surveys) and in developing a weighted, combined objective function reflecting a number of objectives in mathematical programming applications (Mitchell and Bingham 1986; Bard 1986; Olson, Venkataramanan, and Mote 1986). Also, the AHP has been utilized to convert qualitative factors to quantitative scales, both in analyses involving one decision maker, as well as in group settings (Tummala 1988).

After the AHP modeling technique was explained to the members of the decision group, all of them agreed that the AHP was a good modeling technique that would aid them in adding structure to the evaluation step in the decision-making process. The decision was carried out, and the Expert Choice package was used.

**The Analytic Hierarchy Process in a Group Context**

The AHP is based on a trade-off concept that will be used to determine the overall relative importance of a set of attributes or criteria associated with a decision problem. This is accomplished by structuring any complex, multiperson, multicriterion and multiperiod decision problem into several hierarchies, with weights assigned in the form of a series of pairwise comparison matrices. These comparison matrices are used to determine the normalized weights which allow the evaluation of the attributes at the lowest level of the entire hierarchy. The modeling process involves four phases, namely,

1. Structuring the Problem
2. Collecting the Data
3. Estimating the Relative Weights
4. Deriving the Solution of the Problem

The AHP process decomposes a complex problem into a hierarchy of different but interrelated sub-problems which are characterized by a set of attributes. Using a nine-point scaling system, a matrix of pairwise comparisons is constructed where the entries indicate the strengths with which one attribute dominates another. This scaling formulation can be translated into a largest eigenvalue problem which results in a normalized and unique vector of weights for the elements in each level of the hierarchy. These weights are then used to determine the single composite vector of normalized weights reflecting the relative importance among attributes at the lowest level of the hierarchy that enables the accomplishment of the objective of the problem. Thus, the AHP process combines subjective evaluations with domain-specific technical knowledge in a hierarchical framework.

**Structuring the Problem**

The structuring phase consists of decomposing any complex decision problem into a series of hierarchies
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