INTERNATIONAL JOURNAL OF RESEARCH IN COMMERCE & MANAGEMENT

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INTERNATIONAL JOURNAL OF RESEARCH IN COMMERCE & MANAGEMENT

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A SCIENTIFIC APPROACH USING FUZZY LOGIC IN OPERATIONS MANAGEMENT

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ABSTRACT
This paper discusses the role of Quantitative Network Analysis in Business Management. How the business organizations can use those as business applications and competitive advantage tools. This paper will attempt to demonstrate project management. Any organization involves planning, scheduling, and controlling a number of inter related activities with use of limited resources, namely men, machines, materials, money and time. The projects may be extremely large and complex such as construction of a power plant, a highway, shopping complex, ships and air craft's, introduction of new products and research and development projects. It is required that managers must have dynamic planning and scheduling system to produce the best possible results and also to react immediately to the changing conditions and make necessary changes in the plan and schedule. Convenient analytical and visual techniques such as shortest route (SR), Minimal Spanning Tree (MST), prove extremely valuable assisting the managers managing the projects.

KEYWORDS
Competitive advantage, Planning, scheduling, Controlling, Shortest route (SR), Minimal Spanning Tree (MST).

1. INTRODUCTION
T his study discusses the Network analysis in Business Management. It is a scientific approach to Managerial decision making. How the Business Organizations can be successful by use of Network analysis. This would help the Organization in solving complex problems on time, with greater accuracy and in the most economical way.

The Minimum Spanning Tree (MST) problem is to find a least cost spanning tree in an edge weighted graph. The efficient polynomial-time algorithms to solve MST problems have been developed by [5] and [8]. In the real world, MST problems are usually seen in network optimization. For instance, when designing a layout for telecommunication systems, if a decision maker wishes to minimize the cost for connection between cities, it is formulated as an MST problem. As other examples, the objective is to minimize the time for construction or to maximize the reliability.

Most research papers with respect to MST problems have been dealt with the case where each weight is constant. However, in order to investigate more realistic cases, it is necessary to consider the situation that one makes a decision on the basis of data in or construction often depends on economical environments which vary randomly, and experts often estimate the value of the cost not as a constant but as an ambiguous value. In order to take account of such situations, we shall deal with minimum spanning tree problems where each edge weight is a fuzzy random variable. We call it a Fuzzy Random Minimum Spanning Tree (FRMST) problem.

A fuzzy random variable was first defined by [6]. Recently, some researchers [3, 9] considered fuzzy random linear programming problems. We could take various approaches to an FRMST problem according to the interpretations of the problem. In this paper, we take a possibilistic and stochastic programming approach, which is based on the idea provided in [3], As it is shown later, the formulated problem is transformed into the deterministic equivalent nonlinear maximum ratio spanning tree problem, which is generally an which is generally an NP-hard problem. In order to obtain an approximate optimal solution, we employ a solution method through TS [1, 2].

Today, several quantitative techniques are available to solve managerial problems and use of these techniques helps to managers become explicit about their objectives and provides additional information to select on optimal decision. This study presents with variety of these techniques with real life problem areas. Use of past data in a systematic manner and constructing it into a suitable model for future use comprises a major part of quantitative techniques. There are many quantitative algorithms like Kruskal's [5] and Prim's [8] etc. That has been developed to determine and analyze the problems. In this paper we use Kruskal's with Fuzzy random edge weights.

2. MST PROBLEM WITH FUZZY RANDOM EDGE WEIGHTS
Consider a connected undirected graph G = (V, E) where V = { v_1, v_2, ..., v_n} is a finite set of vertices representing terminals, telecommunication stations or regional computer stations etc, and

E = {e_1, e_2, ..., e_m}is a finite set of edges representing connections between these terminals or stations. Let T be spanning tree in the graph G. Let x = (x_1, x_2, ...x_m) denote its characteristic vector defined by

$$x_i = \begin{cases} 1 & \text{if } e_i \text{ is an edge of } T \\ 0 & \text{otherwise} \end{cases}$$

$i = 1,2,3,........,m$

In this paper, we consider an MST problem involving fuzzy random weights as follows

$$\begin{cases} \min \bar{c}x \\ \text{s.t. } x \in X \end{cases}$$

Where x = $(x_1, x_2, \ldots \ldots x_m)^t$ is a decision variable column vector C = $(c_1, c_2, \ldots \ldots, c_m)$ is a coefficient vector and X stands for the set of characteristic vectors representing all possible spanning trees of the graph G.

Each C_j is a fuzzy random variable with the following membership function.

$$\mu_{cj}(t) = \begin{cases} \max\left\{0, 1 - \dfrac{\overline{c}_j - t}{\alpha_j}\right\}, & if \ t \le \overline{c}_j \quad j = 1, 2, \ldots m \\[4mm] \max\left\{0, 1 - \dfrac{-t - \overline{c}_j}{\beta_j}\right\}, & if \ t \ge \overline{c}_j \end{cases}$$

Where $\overline{c}_j$ denotes a random variable, whose realization under scenario s is Cj,s parameters α_j and β_j denote the left and right spread of a fuzzy number,

respectively. Let p_s be the probability that a scenario s occurs, and let s denote the number of scenarios. We assume that $\sum\limits_{s=1}^{s} p_s = 1$ holds.

Since the coefficients of the objective function are triangular fuzzy random variables, the objective function also becomes the same type of fuzzy random variable y with the following membership function.

$$\mu_{\overline{y}}(y) = \begin{cases} \max\left\{0, 1 - \dfrac{\sum\limits_{j=1}^{m} \overline{c}_j x_j - y}{\sum\limits_{j=1}^{m} \alpha_j x_j}\right\}, & if \ y \le \sum\limits_{j=1}^{m} \overline{c}_j x_j \\[8mm] \max\left\{0, 1 - \dfrac{y - \sum\limits_{j=1}^{m} \overline{c}_j x_j}{\sum\limits_{j=1}^{m} \beta_j x_j}\right\}, & if \ y \ge \sum\limits_{j=1}^{m} \overline{c}_j x_j \end{cases}$$

Considering the impression or fuzziness of the decision maker's judgment, for each objective function of problem. we introduce a fuzzy goal $\overline{G}$ with the membership function expressed as

$$\mu_{\overline{G}(y)} = \begin{cases} 0 & , \ y > g^0 \\[2mm] \dfrac{y - g^0}{g' - g^0}, & g' \le y \le g^0 \\[2mm] 1 & , \ y < g' \end{cases}$$

3. AN EXAMPLE PROBLEM

The Southwestern Regional Computer Center must have special computer communication lines installed in order to connect five satellite users with a new central computer. Because the lines are expensive, the computer center's management wants the total length of the new communication lines to be as small as possible. While the central computer could be connected directly to each user, it appears to be more economical to install a direct line to some users and let other users tap into the system by linking up with the users who are already connected to the system. The network shown in Figure1 shows us the links being considered between the regional computer center and the satellite users. The distance, in miles, between locations is shown above the associated with edges. Note that the network has 6 vertices and 11 edges.

FIGURE 1: COMMUNICATIONS NETWORK FOR THE REGIONAL COMPUTER SYSTEM
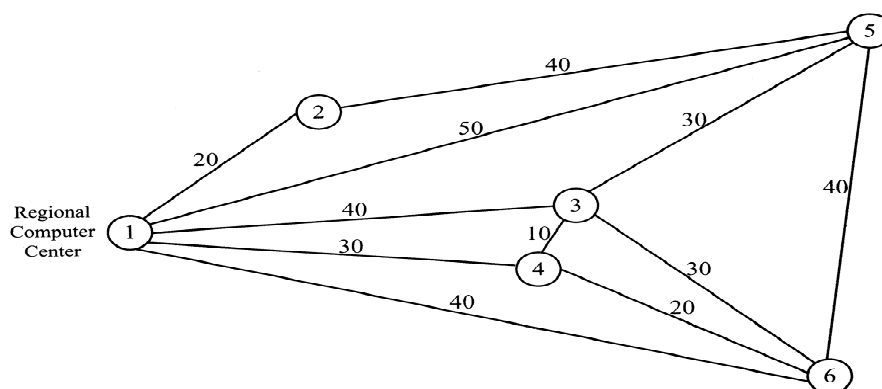
Here E= {20, 40, 30, 40, 40, 50,30, 10 30, 20, 40} and X = { 1, 2, 3, 4, 5, 6} by using the above fuzzy random edges weights if the edge is in MST it is 1 otherwise 0, finally the MST of the above problem is

i.e. X_1 =1 then Min{20,50,40,30,40} = 20 then the edge is in MST it is 1 similarly it is searching to every X_i, where i = 1,2,3,4,5,6 at last we get the following MST

FIGURE 2
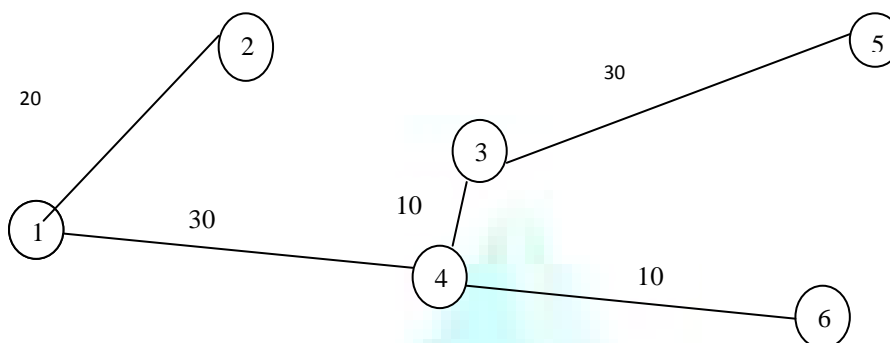
The above MST Figure 2 is minimized the length of new communication lines, now the length is 110kms.

4. CONCLUSION
It is very useful to minimize the cost and time and maximizes the profit of the project for all Network projects. Using this technique manager can take decision quickly and it is useful to give a bid value for the project he can send the bid quickly.

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