TOTAL VALUE CONTROL IN CONSTRUCTION THROUGH MULTIPLE CRITERIA DECISION MAKING (MCDM)

by

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Dedicated to
my parents
and
Rashmi, my wife.

CERTIFICATE

This is to certify that the thesis entitled **"Total Value Control in Construction through Multiple Criteria Decision Making (MCDM)"** being submitted by **Mr. Manoj Kulshrestha** to the Indian Institute of Technology, Delhi, India, in fulfilment of the requirements for the award of the degree of **Doctor of Philosophy**, is a record of bonafide research work carried out by him under my guidance and supervision.

To the best of my knowledge, the thesis has reached the requisite standard. The research report and the results presented in this thesis have not been submitted, in part or full, to any other University or Institute for the award of any degree or diploma.

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(Manoj Kulshrestha)

ABSTRACT

Construction is one of the largest industries in the world. It is the second largest economic activity in India, only next to agriculture, both in terms of the capital investment and manpower employment. It forms the very foundation of the nation's development and is a measure of its economy and progress.

In India, a large number of construction projects are being implemented under the five year plan programmes and a huge capital investment is being made in these projects. The spiraling construction costs and ever increasing tightening of money have fostered a need for obtaining the full value of every rupee spent on these projects. Value Engineering, is the technique which is normally, employed for this purpose. It analyses the value and reliably provides the essential performance of the project at the optimal cost.

In this study, a purposeful attempt to look at value in a more scientific and realistic manner, has been made. Value has been viewed as one parameter, which encompasses the time, quality and cost components, the three vital factors of any construction project from control point of view.

Total value control, in this study, includes the consideration of some non-economic attributes, such as functional and performance attributes to arrive at the optimum value. In this process, one encounters the complexity of the decision process by the conflicting multiplicity of these attributes. The study, presents some concepts of multiple criteria decision making (MCDM) to deal with the situation.

Further, for this purpose, a value control implementation model involving multiple criteria decision making techniques has been developed which replaces the present subjectivity in altemative evaluation by providing objectivity in subjective decision making. This model is implemented through specifically designed multiattribute action plan (MAAP) developed for this purpose. The model has been termed as "Multiple Criteria Value Management (MCVM)."

In this study, two of the MCDM techniques namely, analytical hierarchy process (AHP) and fuzzy set methodology (FSM) have been discussed in detail supported by case studies/examples for the MCVM implementation.

In the second aspect of the study, a matrix based methodology for analysis in VE has been developed. The technique is capable of determining and/or verifying the basic function(s) of complex components of construction projects and provides with a means of separating those functions which are there in the element because of the present design approach. Thus, helping in identifying the potential areas for VE application in the system.

Finally, to consider time component of value, a project monitoring system with the use of VE-MCDM combine has been developed. A case study of a school building construction project of Kendriya Vidyalaya Sangathan (KVS) has been included to illustrate the technique.

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