A Developed AHP Method Applied to the Comparison of Port Projects’ Plane Layout Alternatives

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ABSTRACT

According to the reality of the comparison of port projects’ plane layout alternatives, the paper develops the traditional AHP method and applies it in the comparison of port projects’ plane layout alternatives. Then, the paper takes Q port’s certain wharf for example to prove the correctness of the developed method and the feasibility of applying it in the comparison of port projects’ plane layout alternatives. Simultaneously, the paper designs a universal computer program, through which the investing party can easily select the optimal alternative. In addition, the paper lists several evaluation indexes as a reference.

KEY WORDS: The developed AHP method; the decision matrix; group decision making; the comparison of plane layout alternatives; port projects; evaluation indexes.

INTRODUCTION

As is known to all, port projects are very significant to a country. Not only because their investment are very huge, but also because port projects always impact deeply on a country’s national economy, society, environment and so forth. Therefore, before the project establishment, feasibility study plays a very important role. Subsequently, selecting the optimal alternatives from plane layout alternatives, in another word, the comparison of the plane layout alternatives is the key.

Nowadays, the traditional method is just to compare quantitative indexes, for example, economic indexes and technical indexes, ignoring qualitative indexes which are usually very important, or use simple method, for example, the Storming Method. Obviously, the traditional method is not scientific enough.

The model of the comparison of plane layout alternatives belongs to a kind of the complex Multiple Attribute Decision Making models. There are many Multiple Attribute Decision Making methods. In 1970s, the American operational researcher Saaty presented the Analytical Hierarchy Process (AHP) to evaluate the type of models containing both quantitative indexes and qualitative indexes, which was a very useful method, having been applied to many different fields.

However, the method was seldom used in the comparison of port projects’ plane layout alternatives. Besides, if it was used in the field of port projects, the traditional AHP method needed to be improved.

According to the reality of the comparison of port projects’ plane layout alternatives, the paper makes efforts to improve the traditional method. The developed method not uses the 1-9 Scale Method absolutely, but makes full use of the information from the plane layout alternatives. Then, the developed method skillfully standardizes the indexes’ values to derive the decision matrix through the Bipolar Method and the Linear Transformation Method, solving the problem of qualitative indexes, different dimension and inconsistent direction. To calculate the alternatives’ weights with respect to criteria, the developed method simplifies the algorithm. Besides, the developed method presents the group decision making method.

Then, the paper takes an example to prove the correctness of the developed method and the feasibility of applying it in the comparison of port projects’ plane layout alternatives.

Simultaneously, aiming to the problem of few designers and experts understanding the theory of Multiple Attribute Decision Making Method in real project fields, the paper designs a universal computer program, through which the investing party can easily select the optimal alternative.

In addition, the paper lists several evaluation indexes which contain the aspects of economy, technology and environment and so forth, as a reference.

THE DEVELOPED AHP METHOD

In this developed AHP method, in order to obtain the optimal alternative of a port project’s layout, it calls for joint efforts between the designer of these plane layout alternatives and the experts who in this situation only give professional advice but not impact the content of alternatives. Compared with the traditional AHP method, there are many differences, nearly in every step. The concrete steps are as follows.