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Urban Renewal Project Selection Using the Integration of AHP and PROMETHEE Approaches

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Abstract

Appropriate project selection has a significant impact on construction companies' success. Selecting the appropriate project is complicated due to uncertainties related to many factors that may influence the project selection process. The uncertainties related to a construction project may vary according to the type of the construction project. Therefore, having a project selection tool, which assists construction companies in selecting a particular construction project, can be a significant advantage in achieving success. Urban renewal projects constitute a significant portion of the projects that are carried out by construction companies in Turkey. This study aims to propose an integrated approach for selection of urban renewal projects. The proposed approach combines analytic hierarchy process (AHP) method and PROMETHEE, to help construction companies in selecting the appropriate urban renewal project. AHP and PROMETHEE were used to find the weights of the selection criteria and to rank the alternative projects, respectively. The proposed approach is used to solve a project selection problem of a Turkish construction company, which is mainly specialized in urban renewal projects. In the case study, twelve different projects were ranked according to seventeen evaluation criteria by using the proposed approach. The findings of this study revealed that the proposed approach can be a useful tool for construction companies, which are especially specialized on urban renewal projects.

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1. Introduction

Turkey is one of the most earthquake-prone countries in the world. Due to having too many buildings (e.g., public buildings, residential buildings, etc.) that are not safe enough to survive during a major earthquake, Istanbul has become a specific focus of many urban renewal projects. In typical urban renewal projects, public authorities purchase properties from many different private owners, renew and resell them to other private owners [1,2]. However, it should be noted that the execution of urban renewal projects is different in Turkey from the execution of typical urban renewal projects due to the regulations established by public authorities. In Turkey, public authorities are not involved in purchasing, renewing and reselling of properties, but establishing the regulations guiding the planning and execution of urban renewal projects. Inhabitants, who are residing in urban renewal districts that are specified by law, hire a contractor to renew their buildings. The contractor agrees to rebuild the building in return for owning a number of units. In order to support the renewal of unsafe buildings, the regulations guiding the planning and execution of urban renewal projects allow the owners to build more square meters when they hire a contractor to renew their building. Contractors are responsible for the cost of the project in return for a number of units to sell.

At this point, selecting appropriate urban renewal project gains importance for contractors as they take more risk than any party involved. Several studies have been conducted on developing a model for project selection over the last years [2-7]. Developing a generic model for selecting the most appropriate project is difficult due to the fact that factors affecting the selection of a construction project may vary according to the type of the construction project. Therefore, in today's competitive construction environment, construction companies can take advantage of having a tool assisting them in selection of a particular type of the construction project. Since urban renewal projects constitute an important portion of the construction projects that are carried out by construction companies in Turkey, this study aims to propose an integrated approach for selection of urban renewal projects. The proposed approach combines analytic hierarchy process (AHP) method and PROMETHEE, to help construction companies in selecting the most appropriate urban renewal project. In the proposed approach, AHP is used to calculate the weights of the factors and PROMETHEE is used to rank the alternative urban renewal projects. The proposed approach is also applied in a construction company that is mainly specialized in urban renewal projects.

2. Research Methodology

The main objective of this study is to propose an approach for selection of urban renewal projects in Turkey. The proposed approach can be adopted and adjusted by any construction company that is interested in urban renewal projects. The tasks that were performed in this study can be summarized as follows: (1) identifying the factors that affect the selection of appropriate urban renewal projects; (2) integrating AHP and PROMETHEE for selection of urban renewal projects; and (3) applying the proposed approach to solve a project selection problem of a Turkish construction company, which is mainly specialized in urban renewal projects. In the following subsections, a brief review of AHP and PROMETHEE methods are presented.

2.1. The AHP method

It is acknowledged by the researchers that AHP is one of the most commonly used techniques for solving multi-criteria-decision-making problems since it was developed by Saaty (1980) [8]. The intention in using AHP is to have manageable and measurable components rather than complex and unstructured components for multi-criteria-decision problems. There are mainly five steps of AHP [8]:

- *Defining the decision problem and determining its goal.*
- *Establishing a decision hierarchy*: The hierarchy is comprised of highest, middle, and lowest levels that represent the goal of a decision problem, multiple criteria, and alternatives, respectively. The relationship between the elements of a level with those of the level immediately below is indicated with this hierarchy.
- *Comparing the elements in the corresponding level in pairs*: This comparison is done in terms of the degrees of influence on the specified element in the higher level of the decision hierarchy. A standardized nine-point scale of measurement, which converts human preferences between available alternatives as