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Multi-criteria Decision-making in Situations with a Large Number of Alternatives

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Abstract

A decision making process sometimes becomes overwhelming in situation where the criteria for a successful decision are complex, and when there are numerous possible alternative actions to consider. To precisely compare alternatives, the ideal approach is to use a pair-wise evaluation in which each option is carefully weighed against every other option. However, in real-world situations such rigorous evaluations often cannot be undertaken due to time limitations and the large number of possible options. To address this problem, this paper presents a novel decision-making process for situations in which there are a large number of alternatives and multiple criteria. The proposed decision-making technique combines a profile model, a checklist model, and an analytical hierarchy process. An example is provided in which the proposed method is used to select from among thirty alternatives with three criteria. Applications of this approach to problems with even greater numbers of alternatives and success criteria are also possible. This proposed approach can be applied by transportation managers who are seeking to prioritize maintenance projects within an extensive roadway network, or construction managers who are deciding among different materials while evaluating complex factors such as weight, expense, and holding capacity.

Keywords

Decision-making, Profile Model, Checklist Model, Analytical Hierarchy Process

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Amir Hessami is an assistant professor of construction management in the Department of Civil and Architectural Engineering at Texas A&M University–Kingsville (TAMUK). He holds a Ph.D. in Civil Engineering (Construction Management) from Texas A&M University, an M.Sc. in Civil Engineering (Hydraulic Structures) from Sharif University, and a B.Sc. in Civil Engineering from Ferdowsi University. His research is in the areas of infrastructure asset management, project management, and

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