

Multi Criteria Decision-Making Models for Repair and Replacement Decisions in Condition Based Building Maintenance

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Rising number of aged building stock have critical importance on the economic and social well-being of a country. For institutional organizations, particularly those with large building portfolios, an effective facility management approach is required to ensure these buildings function properly for their missions. As a part of facilities management, building maintenance activities occupy a significant role in reaching the goal of delivering an acceptable level of performance while minimizing costs and failures. Moreover, the effect of economic challenges and budget cuts place significant constraints on repair and replacement decisions in the building maintenance process requiring techniques to ensure efficient decisions.

Decision-making processes are a significant part of operations research which applies statistical analysis and mathematical modeling to handle complex organizational problems requiring a large amount of information and knowledge. Facilities management and building maintenance is an example of such a complex problem. Multi Criteria Decision-Making (MCDM) is one family of decision-making processes which deals with providing optimal results in complex scenarios including various indicators and criteria.

The building maintenance process depends on many factors, and it is usually specific to building characteristics and occupancy. Additionally, according to Yau, (2012) it is clear that a decision maker should consider different criteria for building maintenance process for example existing condition, building age, redevelopment opportunity, etc. The application of MCDM enables the decision makers to create their own set of significant criteria for the final decision of maintenance activities and to accommodate the complexity introduced by various components (Jin Lin, Ali, & Alias, 2014).

The main purpose of this study is to generate a decision-making model to support effective repair and replacement decisions for building maintenance. Expected results of the study include the development of a condition based assessment framework, identification of the significant criteria for the decision-making model, identification of the most frequent failures in building maintenance in institutional facilities, and determination of the benefits of MCDM process in building maintenance. Additionally, expected outcomes of the study include the development of a resource efficient condition assessment process for building maintenance recognizing limits in both personnel and other resources, and identification of the effects of various criteria on decisions - showing the importance of other criteria beyond cost and budget to final decisions. Finally, the study will present the effect of using the decision making model on the final decisions through comparison between decisions made with and without using model. Moreover, the high expectations of occupants in facilities of higher education institutions increase the need for effective facilities management strategies with limited resources. This research is expected to address that need by providing the following impacts: improving the quality of maintenance services with effective resource allocation and failure prevention, increasing the occupant satisfaction with the increase of service quality, and assisting the facilities management executives of large portfolios to understand and compare the building maintenance needs of each individual building.

Keywords: Facilities management, Building maintenance, Decision Making, Multi Criteria Decision Making

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