Reconsidering the Multiple Criteria Decision Making Problems of Construction Projects; Using Advanced Visualization and Data Mining Tools

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The construction project managers have to make tough decisions. They are considering different tools of IT and would like to invest on getting better data analysis tools for enhancing their decisions. The increasing of IT usage in construction projects has been the most effective option for improving the process of problem solving [1, 4, 6]. However making critical decisions for the complicated and multiple criteria problems of construction projects cosidering multiple coflicting criteria in which a huge amount of data involved is not a simple task to do. As the datasets of our problems, i.e. construction projects analysis dealing with waste management, productivity improvement, environmental impacts, human and IT factors, emergy based lifecycle, and process optimization, are often huge they can not easily be handled with the traditional means of data analysis. In order to better manage the data collected and make the most of our datasets a series of the advanced interactive visualization and data mining tools [5] are utilized. Using data mining tools for processing the large-scale data involved in the multiple criteria decision-making problems is previously considered in [2, 7].

Here the idea for solving the multiple criteria decision-making problems is to visually model and clarify the whole dimension of the problems. Interesting patterns are automatically extracted from our raw dataset via the data mining tools e.g. reducing the dimensionality and the dataset size, multidimensional scaling, clustering and user interaction. Additionally the advanced visual analytical interfaces are involved to support the decision maker interactively. With such tools i.e. parallel filters and clustering tasks, the decision maker can solve multi-objective optimization problems as it amends previous approaches [7]. Furthermore the animations of sweeping through data and advanced visualizations including 7D plots accomplish managers and enable them to screen the data at their consulting room making decision interactively.

The effectiveness and performance of the interactive visualizations are evaluated along with a number of study cases related to construction workers [1]. Along with our study cases the aspects of data mining, modeling, and visualization the data related to construction workers are considered and briefly presented in this article. As the main result, the achieved hidden information through visualization tools has enhanced the final decisions. Moreover the 7D plots and the option of sweeping through data and clustering [3, 5] have been found to be very useful for our challenging applications.

Keywords: Building construction workers, IT usage in construction projects, reactive business intelligence, reactive search, multiobjective optimization, multiple criteria decision making, interactive visualization, multi-dimensional plots, Grapheur, LIONsolver, 7D graphs, Clustering and sweeping through data

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