INTED 2015
9TH INTERNATIONAL TECHNOLOGY, EDUCATION AND DEVELOPMENT CONFERENCE

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- Curriculum Design and Innovation
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- Educational Research Experiences
- Educational Software and Serious Games
- Enhancing learning and the undergraduate experience
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- Virtual Universities
- Vocational Training
TEACHING STUDENTS HOW TO SOLVE COMPLEX ENGINEERING PROBLEMS BY USING DECISION MAKING APPROACHES: VALUE ANALYSIS

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Abstract

The engineering profession plays a major role in the development of society. It wields enormous influence over economic activity, employment and growth rates. However, industry also has a substantial impact on the natural environment, the effects of which are evident across the world. Over recent decades, pioneering initiatives from professionals have proposed friendly and sustainable engineering solutions that should be strongly integrated in our engineering faculties such as a usual subject. Accordingly, authors are going to present an Integrated Value Model for Assessment (IVS) future decision-makers (nowadays engineering students) at any discipline: to select the most sustainable construction project, to select the most convenient materials for a specific application, to select the best raw material for a specific sector, etc.

The IVS methodology here presented applies a requirements' tree to quantify the value of a decision at various hierarchical levels, in order to assess the final decision and compliance with some criteria (economical, technical, etc.). On the other hand, the scope of this methodology is not the same as others which use indexing systems to account attributes in decision-making. The Analytic Hierarchy Process is applied at IVS methodology, by combining Multi-Criteria Decision Making process and the Function Value Analysis concept. This is done in order to standardise a set of indicators, for making possible their comparison, because of their different units.

The main objective of present paper is to develop a method that enables a more appropriate definition of somewhat vague concepts such as slight or moderate impact, by representing uncertainty predictions during assessment. In other words, the IVS methodology proposes a valuation process for indicators and weightings at sublevels. This approach is effective and appropriately integrated with the indicators, subcriteria, criteria and assessment areas (hierarchy tree) used to assess the higher overall "index value" of IVS.

For a best practice of engineering students, it is proposed an example referred to a typical industrial building with pre-defined morphological characteristics and production processes. Besides, two separate geographical study areas were established which involve two different buildings (design options). These two solutions differ in terms of the following aspects: materials and construction elements, site characteristics, construction and end-of-life demolition processes, waste management during their different life-cycle stages, and water and energy saving measures while in use. Therefore, the final IVS “index value” of both buildings was obtained, being the industrial building with the highest IVS value the best solution to be adopted.

Keywords: Decision Making, Case Study, Engineering, Function Value Analysis, Hierarchy Tree, Index Value, Indicators, Weighting.

1 INTRODUCTION

It is well known how the decision making methodologies [1], versus the traditional approaches [2], are a friendlier tool, in terms of selecting the best solution at any kind of engineering problem solving approach. In our engineering schools, faced to the huge variety of teaching disciplines [3], we may teach students how to manage the selection of the best option, in terms of best practice (obviously) but, why not, in terms of value analysis [4] too. For example, it could be listed some cases of engineering problems based on multcriterias decision making [5] in terms to select: the best strengthening solutions for ancient concrete structures [7], the best options in terms of sustainable urban planning and rehabilitations [8-9], the most sustainable project design for industrial buildings [10], the best material (“green” concrete) for building structures [11], the best health & safety project development [12], etc.
ACKNOWLEDGEMENTS

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REFERENCES


