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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 us 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 multicriteria 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.

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REFERENCES

[1] Brugha, C. (2004). Structure of multi-criteria decision-making. Journal of the Operational Research Society 55(11), pp. 1156-1168.

[2] French, S., Geldermann, J. (2005). The varied contexts of environmental decision problems and their implications for decision support. Environmental Science & Policy 8(4), pp. 378-391.

[3] Salo, A., Gustafsson, T., Ramanathan, R. (2003). Multicriteria methods for technology foresight. Journal of Forecasting 22(2-3), pp. 235-255.

[4] French, S., Geldermann, J. (2005). The varied contexts of environmental decision problems and their implications for decision support. Environmental Science & Policy 8 (4), pp.378-391.

[5] Brugha, C. (2004). Structure of multi-criteria decision-making. Journal of the Operational Research Society 55(11), pp. 1156-1168.

[6] Blanco, J.M., Vazquez, L., Peña, F. (2012). Investigation on a new methodology for thermal power plant assessment through live diagnosis monitoring of selected process parameters; application to a case study. Energy 42(1), pp. 170-180.

[7] Larrinaga P. (2011). Flexural strengthening of low grade concrete through the use of new cement-based composite materials. PhD Thesis, University of the Basque Country, Spain.

[8] Herranz-Pascual, M.K., Eguiguren-García, J.L., Proy-Rodríguez, R., Cuadrado-Rojo, J. (2013). New tools to support decision making in urban planning. Model of sustainability assessment of municipal action plans. Dyna 88(4), pp. 462-472.

[9] Velazquez, I., Verdaguer, C. (2003). Estrategias europeas y españolas hacia la sostenibilidad urbana. Urbanismo para un desarrollo más sostenible Congress 2003. Palma de Mallorca, Spain.

[10] San-José, J.T., Garrucho, I., Losada, R., Cuadrado, J. (2007). A proposal of environmental indicators towards industrial building sustainable assessment. The International Journal of Sustainable Development and World Ecology 14(2), pp.160-173.

[11] Gómez-López, D., del Caño, A., de la Cruz, M.P. (2013). Early estimation of the sustainability level of concrete structures, in the framework of the EHE-08 spanish code. Informes de la Construccion 65(529), pp. 65-76.

[12] Reyes, J.P., San-José, J.T., Cuadrado, J. Sancibrian, R. (2014). Health & Safety criteria for determining the sustainable value of construction projects. Safety Science 62, pp.221–232.

[13] Saaty, T.L. (2008). Decision Making with the Analytic Hierarchy Process. International Journal of Services Sciences 1(1), pp. 83-98.

[14] San-Jose, J.T., Cuadrado, J. (2010). Industrial building design stage based on a system approach to their environmental sustainability. Construction and Building Materials 24(4), 438–447.

[15] Del Caño, A., Gómez, D., De La Cruz, M.P. (2012). Uncertainty analysis in the sustainable design of concrete structures: A probabilistic method. Construction and Building Materials 37, pp. 865-873.

[16] Blanco, J., Peña, F. (2009). A particular survey on the student's perceptions about the implementation of the ECTS system for higher education according to the Bologna criteria. Proceedings INTED 2009, Valencia 9-11 March, Spain.