

A Method for Interactive Multi-Criteria Decision Support within Corporate Environmental Management Information Systems for Small and Medium-Sized Enterprises

Small and medium-sized enterprises are the backbone of many industrial countries. They employ the majority of the workforce and are responsible for a large proportion of the environmentally relevant production processes. Due to the technological progress these enterprises gain the possibility to reduce the environmental impact of their processes. However, this potential is not used by all enterprises, because measures to increase sustainability are difficult to evaluate concerning the economic, environmental and social benefit. One obstacle which hinders an improvement of the environmental performance is the lack of easy to understand decision support systems and their underlying methods which meet the requirements of small and medium-sized enterprises.

Therefore, the present dissertation examines how a decision support method is able to support sustainability decisions in a business context. This requires, besides economic key figures, also environmental, social and to some extent even technical parameters to be evaluated. A lot of the required information is already accessible by the companies and stored within corporate environmental management information systems. An interface to these systems seems desirable. The resulting reduction of media disruptions reduces mistakes and speeds up the decision support. Additionally, the user is familiar with the existing systems, which improves the adaptation and usage of the developed method.

It is also examined how a decision support method is able to provide comprehensible and at the same time trustworthy results. These are important requirements, which must be met in order to propagate the method in small and medium-sized enterprises. Users in these companies do not have the time to become familiar with the respective theory of decision support. Most of the time, an external analyst is not an option for the companies, because of the financial strain. This means users are reliant on the fact that they are able to use the system by themselves without any further help. However, both requirements contradict each other to some extent. On the one hand, a comprehensible system should require only a few inputs from the user and should be based on a reasonable aggregation technique. On the other hand, trustworthy results require that users recognize that their subjective inputs (e.g. preferences) have an influence on the final results. To combine both requirements the evaluation of the alternatives is done by the objective "Technique for Order Preference by Similarity to Ideal Solution" (TOPSIS) method which is extended by interactive and subjective elements as well as a sensitivity analysis. An evaluation with TOPSIS is based on reference points and requires besides a criteria weighting no other inputs of the decision maker. This makes TOPSIS relatively easy to understand and use. However, to increase the trust in the decision support the decision maker is given the opportunity to adjust the reference points according to his preferences. This is done by aspiration and saturation levels. To further increase the acceptance the decision maker is offered a sensitivity analysis which examines the stability of the criteria weightings. After a theoretical analysis the developed method is illustrated with the help of a small but practical example.