

Generating Policy Alternatives for Decision Making: A Process Model, Behavioural Issues, and an Experiment

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Abstract

The generation of alternative policies is essential in complex decision tasks with multiple interests and stakeholders. Today such settings are common in the mitigation and management of environmental impacts by governments and industries. A diverse set of policies is typically desirable to cover the range of options and objectives. Decision modelling literature has often assumed that clearly defined decision alternatives are readily available. This is not a realistic assumption in practice. We present a structured process model for the generation of policy alternatives in settings that include non-quantifiable elements and where portfolio optimization approaches are not applicable. Behavioral issues and path dependence as well as heuristics and biases which can occur during the process are discussed. The experiment with the climate change mitigation game compares the results obtained by using two different generation techniques. The results show that the outcome can be process dependent and that cognitive biases can occur and that the use of heuristics is common. Our conclusion is that modelling support in policy problems needs to be combined with processes for the generation of alternatives paying attention to the related behavioral effects.

Keywords

Policy decision, Portfolio decision analysis, Path dependence, Cognitive biases and heuristics

Biographies

Raimo P. Hämäläinen is professor emeritus in the Systems Analysis Laboratory, Aalto University, Espoo, Finland. He has published extensively on engineering systems, decision making and game theory, environmental modelling, as well as developed widely used decision support software. His current interests include behavioral issues in model based problem solving and systems intelligence in organizations and social interaction. He is an Honorary President of the Finnish OR Society and the recipient of Recipient of the INFORMS (Institute for Operations Research and the Management Sciences) Ramsey Medal in 2019 and the INFORMS GDN Section Award in 2021.

Tuomas Lahtinen is a Research Associate in the Systems Analysis Laboratory, Aalto University, Espoo, Finland. His research interests include decision analysis and system thinking. He got his doctorate in Systems and Operations Research in 2018. Currently he is Service Area Director, Business Analytics & AI in Loihde Advance IT Services and IT Consulting. Previously he has been a post-doctoral researcher at the Systems Analysis Laboratory, Head of Development in WEOPTIT IT Services and IT Consulting, and Lead Analyst in Operations Resource Planning in Finnair, Finland.

Kai Virtanen is Professor of Operations Research in the joint professorship of Aalto University Systems Analysis Laboratory and National Defence University of Finland (Department of Military Technology). His research interests include dynamic optimization, decision analysis, discrete-event simulation, simulation-optimization and human performance in complex systems. He is the author of about 90 publications in scientific journals and conferences on these fields. He has directed a broad range of research projects in which operations research techniques have been used in military applications. Professor Virtanen serves as the Chairman of the Systems Analysis Section of the

Scientific Advisory Board for Defence (MATINE) in Finland . In 2013, he was presented with the Medal for Military Merits for long-standing research collaboration in the field of operations research by the Finnish Defence Forces. In 2015, he was nominated as the Operations Researcher of the Year for his contributions in promoting applications and theory of operations research by the board of Finnish Operations Research Society.