

(Software for MCA)

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Software to support MCA

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Multi-criteria methods combine factual information with policy priorities. Therefore, they cannot only support decision-making with multiple objectives but also discussions and negotiations between stakeholders involved in the decision process. Belton and Stewart (2001) state that for the effective conduct of MCA in practice good supporting software is essential. In this way the facilitator, the analyst and the decision maker (DM) are free from the technical implementation details, and are able to focus on the fundamental value judgments and choices. Although it is possible to set up macros in a spreadsheet to achieve this, it is more convenient to make use of specially designed software. Software to be used when working directly with decision makers should be visual and interactive in order to facilitate communication about the problem and the evaluation results. Interactivity permits information on evaluations, impact scores, priorities and other parameters to be easily entered and changed. Effective visual tools can be used to reflect the information provided back to the decision makers, for example by using a graphical presentation of an inferred value function or of an aggregated evaluation result. Then these visual tools can help to create understanding of the essence of the issues. MCA software tools can be subdivided into four groups according to the type of support they provide:

1. Problem structuring for discrete choice problems,
2. Discrete choice problems,
3. Discrete group choice problems, and
4. Discrete spatial choice problems.

Problem structuring for discrete choice problems

Most decision support systems assume that a problem is already structured (cause-effect relationships are known, evaluation criteria are specified, alternatives under evaluation are well described etc.). But in practice this assumption is the exception rather than the norm. Therefore, a number of software tools are available to support the structuring of discrete choice problems.

Discrete choice problems

If a discrete choice problem is structured, many software tools are available to support the evaluation of the problem. Most of these tools are originally designed for individual support, or group support in which the group shares one single set of information.

Discrete group choice problems

Lately, a number of developments have taken place in the field of real group systems. A group system allows more than one user to independently input their own evaluations and provides facilities for synthesising and displaying this information. Group systems can therefore be used to support discussions in stakeholder sessions.

Discrete spatial choice problems

Another development taking place in the field of multi-criteria decision support is the integration of spatial data. Systems that allow space-dependent input data, incorporate spatial multi-criteria evaluation tools and can display the information and results spatially are called spatial decision support systems (see also Herwijnen, 1999 and Uran, 2002). Most of these systems are tailor-made for one specific problem. But tools to support general discrete spatial choice problems can sometimes be found in specific procedures incorporated in a GIS.

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The table below shows a list of software tools that could be used to support MCA in practice. Note that the list is not complete and will, of course, become rapidly outdated. Other listings of MCA software can be found in Belton and Stewart (2001) and at www.lionhrtpub.com/orms/surveys/das/das.html.

Table Software to support multi-criteria analysis

Package	Short description
1. Problem structuring for discrete choice problems	
<i>Decision Explorer 3.2</i>	Qualitative data analysis, linking concepts through cognitive or cause maps (http://www.banxia.com)
<i>Mind Manager 4.0</i>	Structures complex situations through organising ideas and concepts, graphical visualization with icons, graphics, colors and multimedia (http://www.mind-map.com)
2. Discrete choice problems	
<i>Criterion DecisionPlus 3.0</i>	Value function model based on trade-off analysis (http://www.infoharvest.com)
<i>Decision Lab</i>	Promethee, pair wise comparison (http://www.visualdecision.com/dlab_methods.htm)
<i>Definite 3.1</i>	Multi-attribute value functions including option for imprecise preference information, cost-benefit analysis, outranking. (http://www.definite-bosda.nl)
<i>HIPRE</i>	Multiattribute value functions with imprecise preference information (http://www.hipre.hut.fi)
<i>Hiview</i>	Multi-attribute value functions (http://www.enterprise-lse.co.uk)
<i>Logical Decisions 5.1</i>	Multiattribute value functions and the Analytical Hierarchy Process (AHP) (http://www.logicaldecisions.com).
<i>Naiade</i>	Novel Approach to Imprecise Assessment and Decision Environments (http://www.aiaccproject.org/meetings/Trieste_02/trieste_cd/Adaptation/Munda_short.PDF).
<i>VISA</i>	Multiattribute value functions, graphical interaction and presentation (http://www.simul8.com/visa.htm)
3. Discrete group choice problems	
<i>Team Expert Choice</i>	AHP, pair wise comparisons (http://www.expertchoice.com)
<i>VISA Groupware</i>	Multiattribute value functions (http://www.simul8.com/visa.htm)
<i>Web-HIPRE</i>	Multiattribute value functions and AHP (http://www.hipre.hut.fi)
4. Discrete spatial choice problems	
<i>Idrisi 3.1</i>	A GIS that includes the following decision support procedures: WEIGHT (AHP), MCE (boolean combination, weighted linear combination or ordered weighted average), RANK (rank order the cells) and MOLA (allocate pixels to multiple objectives) (http://www.clarklabs.org)
<i>Ilwis</i>	A GIS that includes decision support procedures to assign weights and apply MCA on various ways (http://www.itc.nl/ilwis/)
<i>EMDS</i>	Ecosystem Management Decision Support; combines ArcGIS™, NetWeaver and Criterion DecisionPlus (http://www.fsl.orst.edu/emds)