

# JSMAA

open source software for SMAA computations

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# Introduction

Although the amount of published MCDA applications has increased substantially in the past 15 years, the impact of decision support systems (including implementation of MCDA) in managerial practice has not

# Why?

- MCDA methods are *useful*, but most lack *usable* software implementation. If software implementation exists, its licensing model is often commercial but development status “experimental” and provided features limited

# Why?

- MCDA methods are *useful*, but most lack *usable* software implementation. If software implementation exists, its licensing model is often commercial but development status “experimental” and provided features limited
- Reported real-life use of MCDA appears in disciplines where models can be constructed and calculated manually or with a general purpose software (e.g. location, financial decision making)
- ⇒ Lot of applications in non-conventional application domains are left unsupported due to lack of integration possibilities

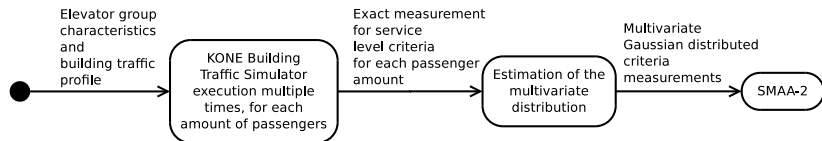


# Model Generation

- Previous analyses\* of MCDA software use cases considered multi-criteria problems as one-off decisions (no need for model generation)
- Increasing number of DSS can benefit from an MCDA module, and MCDA software should allow integration with existing IT infrastructure. Model generation becomes important
- Data standards (e.g. XMCDA) enable model generation, as available data structures are defined in an exact manner

\*French & Xu, JMCDA, 2005; Belton & Hodgkin, EJOR, 1999

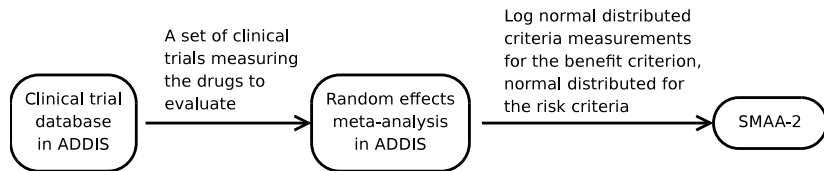
# Application: elevator planning



- Elevator planning aims to configure a suitable elevator group to build in a high-rise building
- KONE building traffic simulator and SMAA

Tervonen & al., Omega, 2008

# Application: benefit-risk analysis



- Drug benefit-risk analysis is done daily by health care pro's to evaluate treatments' BR profiles (efficacy vs safety)
- Aggregate Data Drug Information System (ADDIS - [www.drugis.org](http://www.drugis.org)) and JSMAA

Tervonen & al., SOM Research Report, 2010

# JSMAA

## Main features

- Implements SMAA- $\{2,0,TRI\}$
- Save/load model in XML (close to XMCDa)
- Results visualization

The screenshot shows the JSMAA software interface. The main window is titled 'Benefit-Risk model of second generation'. The left sidebar shows a tree view with the following structure:

- Benefit-Risk model of second generation
  - Alternatives
    - Fluoxetine
    - Paroxetine
    - Sertraline
    - Venlafaxine
  - Criteria
    - Efficacy (selected)
    - Diarrhea
    - Dizziness
    - Headache
    - Insomnia
    - Nausea
    - Preferences
  - Results
    - RankAcc
    - CW

The right pane shows the configuration for the selected 'Efficacy' criterion:

- Criterion Name: Efficacy
- Type: Cardinal
- Scale: [0.98 - 1.23]
- Ascending:
- Measurements:
 

Fluoxetine	LogNormal	0.0	±	0.0
Paroxetine	LogNormal	0.086	±	0.056
Sertraline	LogNormal	0.095	±	0.044
Venlafaxine	LogNormal	0.113	±	0.048

At the bottom of the window, a status bar indicates 'Simulation complete.'

<http://smaa.fi>

# JSMAA

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- Implements **SMAA- $\{2,0,TRI\}$**
- Save/load model in XML (close to XMCDAs)
- Results visualization

File Edit Criteria Alternatives Categories Results Help

SMAA-TRI model of risk z

- Alternatives
  - Z1
  - Z2
  - Z3
  - Z4
  - Z5
  - Z6
  - Z7
  - Z8
  - Z9
  - Z10
- Criteria
  - g1.1
  - g1.2
  - g1.3
  - g1.4
  - g1.5
  - g2.1
  - g2.2
  - g2.3
  - g2.4
  - g2.5.1
- Categories
  - Class 4
  - Class 3
  - Class 2
  - Class 1
- Preferences
- Results
  - CatAcc

Criterion

Name: g1.1  
Type: Outranking  
Ascending:

Thresholds

Indifference: Exact 0.05  
Preference: Exact 0.1

Measurements

Z1	Exact	5.8
Z2	Exact	4.8
Z3	Exact	9.7
Z4	Exact	10.4
Z5	Exact	9.7
Z6	Exact	9.8
Z7	Exact	12.3
Z8	Exact	11.2
Z9	Exact	11.3
Z10	Exact	11.0

Profiles (category boundaries)

Class 4 - Class 3	Exact	8.0
Class 3 - Class 2	Exact	10.0
Class 2 - Class 1	Exact	14.0

Simulation complete. Lambda range [0.65-0.85]

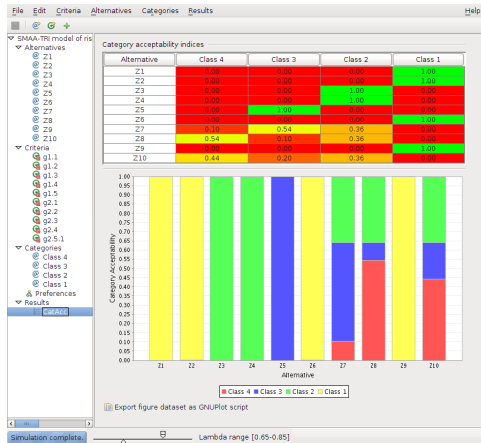
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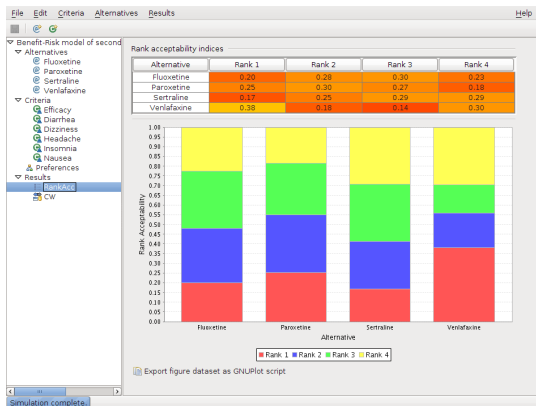


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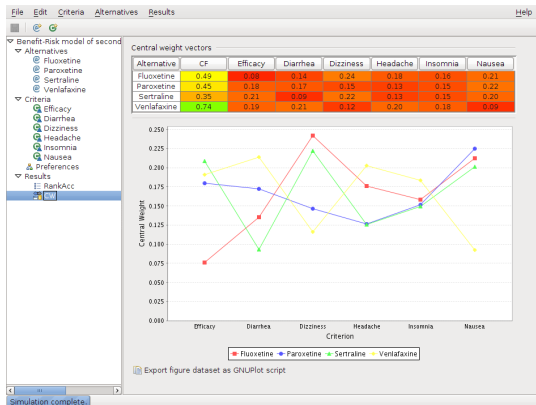
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<http://smaa.fi>



# Review

**My major feeling on reading this paper was one of fear.** In the 1960s/70s/80s, statistical methods were offered in major statistical suites for the first time. The effect was that many users of statistics ran data analyses without consulting statisticians and drew a lot of false inferences as a consequence. (...) The same thing is true within MCDA. Each school is based upon very different philosophies and assumptions even if they draw on the same format of data.

Anonymous reviewer, URPDM'2010

# Conclusions

- The lack of impact of MCDA in managerial practice is partly caused by the current implementation of MCDA methods in proprietary SW that is hard to integrate
- JSMAA's modular design allows integration and provides open source solution for using MCDA as a part of DSS
- Reasoning that only an expert is able to construct mathematically correct models should not be used as an excuse to refrain from developing (re-)usable and open MCDA software components

