

## **Observations from computer-supported Even Swaps experiments using the Smart-Swaps software**

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### **Introduction**

Even Swaps (Hammond *et al.* 1998, 1999) is an easy-to-use multi-criteria decision analytical method based on value tradeoffs. We have developed the Web-based Smart-Swaps software to provide procedural support for the decision maker (DM) to carry out the Even Swaps process. In this presentation, we describe our observations of students making decisions by following the process with the help of the software. Do they like and understand it, how laborious it is felt to be and what is the role and importance of the computer support?

### **Details**

Even Swaps is based on value tradeoffs which are called even swaps. In an even swap, the consequence of an alternative in one attribute is changed and this change is compensated with a preferentially equal consequence change in some other attribute. The new alternative with these revised consequences is equally preferred to the initial one and thus it can be used instead. The aim of the method is to carry out even swaps that make either attributes irrelevant, in the sense that all the alternatives have equal consequences on this attribute, or alternatives dominated, in the sense that some other alternative is at least as good as this alternative on every attribute. Such attributes and alternatives can be eliminated, and the process continues until one alternative, the most preferred one, remains.

The idea of the method is easy, and the process can be carried out even by hand. However, the process can benefit very much from computer support, for example, in managing the consequences table, visualizing the process, keeping the log and tracking the actions taken. We have developed the Web-based Smart-Swaps software (<http://www.smart-swaps.hut.fi>), which is the first software to support the process. The software provides a visual user interface for supporting all of the above-mentioned tasks. It also implements the approach of Mustajoki and Hämäläinen (2005), in which Preference Programming methodology (see Salo and Hämäläinen, 1992, 1995) is applied to produce (i) suggestions for alternatives that could be eliminated as

practically (i.e. almost) dominated in order to eliminate unnecessary even swap tasks, and (ii) suitable candidates for attributes on which to carry out the next even swap.

From a cognitive point of view, there are several characteristics in the Even Swaps process that are of a special interest. These include, for example, what kind of swaps the DMs tend to carry out, how the DMs understand the alternatives with the revised consequences, does the DM end up with the same result following different paths of even swaps, and so on. Now that we have software available to support the Even Swaps method, it is very easy to study how the DMs carry out the process in practice.

In this presentation, we describe our observations gathered in testing the Even Swaps process with 20 engineering students assisted by the Preference Programming approach and the Smart-Swaps software. After a brief introduction to the Even Swaps process each DM carried out two decision analytic assignments. The first one was to carry out the Even Swaps process on a small introductory problem. On this assignment, half of the DMs conducted the process with the Smart-Swaps software whereas the other half used Microsoft Excel instead. The latter assignment was on a much larger problem. On this every DM used the Smart-Swaps software but half of them were instructed to utilize the Preference Programming functionality as opposed to the other half who was instructed to ignore it. Each DM's decision process log was saved for further analysis, and the DMs' opinions on the result, the process and the software were gathered with a questionnaire. The questions were similar to an existing Even Swaps study by Belton *et al.* (2005).

The preliminary results seem to indicate that the software support is indeed perceived to be useful. There was no significant difference in the opinions between the experiment groups utilizing the Smart-Swaps software and Microsoft Excel, but there was a significant difference in the opinions between the group utilizing the Preference Programming approach and the group instructed to ignore it. The Preference Programming approach seemed to provide considerable help to support the Even Swaps process especially on large problems. We are conducting further studies to get a deeper insight on how the DMs perceive the approach in practice.

## References

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