A real Decision Aiding Process
Call for tenders in software acquisition

Alexis Tsoukiàs

LAMSADE - CNRS, Université Paris-Dauphine
tsoukias@lamsade.dauphine.fr
http://www.lamsade.dauphine.fr/~tsoukias
Outline

1. The Problem Situation
2. The Problem Formulation
3. The Evaluation Model
4. The Final Recommendation
Outline

1. The Problem Situation
   - The Story
   - The Actors
   - The Concerns
   - The Resources

2. The Problem Formulation

3. The Evaluation Model

4. The Final Recommendation
In early 1996 a very large Italian company operating a network based service decided, as part of a strategic development policy, to equip itself with a Geographical Information System (GIS) on which all information concerning the structure of the network and the services provided all over the country was to be transferred. However, since (at that time) this was quite a new technology, the company’s Information Systems Department (ISD) asked the affiliated research and development agency (RDA) and more specifically the department concerned with this type of information technology (GISD) to perform a pilot study of the market in order to orient the company towards an acquisition.
Who has a problem?

- The company
- The Information Systems Department
- The Acquisitions Manager
- The Legal Department
- The R&D Division
- The Software Evaluation team within R&D
- The GIS team within R&D
- External experts
- The GIS suppliers and manufacturers
- Academic Advisor
Who is the client?

1. The company is a client in a decision aiding process where the Information Systems Manager act as an analyst.

2. The Information Systems Manager is the client in a decision aiding process where the GIS team and the Software Evaluation team act as analysts.

3. The Software Evaluation team (and associate to it the GIS team) are the clients in a decision aiding process where the Academic Advisor is the analyst.
What are the problems?

- The GIS software as such
- The GIS suppliers
- The use of the GIS within the company
- The power within the company
- The power within the R&D division
- Strategic partnership between the company and the suppliers
Why these are problems?

- Time
- Money
- New Technology
- Acquisition methodology and call for tenders evaluation
- Software evaluation methodology
- European regulations
- Legal constraints
Bid Start

Preparation of call for tenders

Client desired environment study

Methodology study

Call for tenders preparation

Definition of requirements, points of view & decision problem

Problem Formulation

Make invitation letter

First Selection

Tender preparation

Completion of decision model for second selection

Definition of prototype requirements

Lab preparation for prototype evaluation

Prototype Development

Completion of decision model for ranking: definition of criteria & aggregation procedure

Prototype analysis; sorting & final ranking

Final Choice

Invitation letter

First set of answers from suppliers

Second set of answers from suppliers

Prototype Requirements

Prototypes
Outline

1. The Problem Situation
2. The Problem Formulation
   - The Actions
   - The Points of View
   - The Problem Statement
3. The Evaluation Model
4. The Final Recommendation
What are we focussing upon?

- The offers?
- The modules (COTS) within the offers?
- The suppliers?
- The software companies from which the COTS have been taken?

**NB**

The choice of any among the above items is not neutral with respect to the final outcome and will not result in a similar way to make the evaluation.
What are we interested for?

- Technical features and appropriateness for the foreseeable use of the software.
- Performance measurement.

**NB**

The above makes sense if we consider the Information Systems Manager as a client. However, in doing that we have to analyse these points of view taking into account that this client will use the model in another decision aiding process.
What are we going to offer?

Technical advice to the Information Systems Manager as far as the suitability of the offers is concerned with respect to a potential acquisition of some hundreds of licenses of GIS software tailored for specific applications. This has to occur within a call for tenders.

Offers have to be evaluated independently one from another before any recommendation is to be suggested.
What do we evaluate?

The offers received as a reply to the call for tenders.

NB

- This allowed to have specific objects to work with on which the “analysts” had knowledge to use.
- This corresponds precisely to the mandate received by the client.
What do we want to know?

- Land Base Management
- Geomarketing
- Planning, Design and Operating Support
- Diagnosis Support and Customer Support
- Spatial Data Manager
- Software Quality
- Performance on benchmark applications

NB

The above decompose to further nodes through a 5 layers hierarchy down to 134 leaves.
Example 1

Given the leave 1.1.3 “customisation of the user interface in the land-base management” where the possible values are:
- availability of a graphic tool (T),
- availability of an advanced graphic language (E),
- availability of a standard programming language (S),
- no customisation available (N)

We want to know that T > E > S > N
Example 2

Given the node 1.1 “User Interface” decomposable in
- 1.1.1 “standard graphics”: Y>N;
- 1.1.2 “graphic engine”: M>OA>ON
- 1.1.3 “customisation”: T>E>S>N

We want to associate to each offer a value on the scale unacceptable (U), acceptable (A), good (G), very good (VI), excellent (E)
**Are we sure about all that?**

<table>
<thead>
<tr>
<th>Alexis Tsoukiàs</th>
<th>A real Decision Aiding Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>YES</td>
<td></td>
</tr>
</tbody>
</table>
How do we do it?

Example 3

How to classify $x$ with respect to classes $G$, $A$ and $B$ defined by profiles $p_1$ and $p_2$?
Ordinal aggregation of ordinal measures

\[ C_i(x) \iff P(x, p_i) \land \neg S(p_{i-1}, x) \]

\[ S(x, p_i) \iff C(x, p_i) \land \neg D(x, p_i) \]

\[ C(x, p_i) \iff \frac{\sum_{j \in P} w_j}{\sum_j w_j} \geq \delta \]

\[ D(x, p_i) \iff \text{veto condition} \]
A real Decision Aiding Process
## What are the results?

<table>
<thead>
<tr>
<th>O1</th>
<th>O2</th>
<th>O3</th>
<th>O4</th>
<th>O5</th>
<th>O6</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>A-A</td>
<td>G-G</td>
<td>A-VG</td>
<td>A-G</td>
<td>G-VG</td>
</tr>
<tr>
<td>C3</td>
<td>A-A</td>
<td>G-G</td>
<td>A-VG</td>
<td>G-G</td>
<td>A-A</td>
</tr>
<tr>
<td>C4</td>
<td>A-G</td>
<td>G-VG</td>
<td>A-VG</td>
<td>G-VG</td>
<td>A-VG</td>
</tr>
<tr>
<td>C5</td>
<td>U-U</td>
<td>G-VG</td>
<td>G-G</td>
<td>A-G</td>
<td>G-VG</td>
</tr>
<tr>
<td>C6</td>
<td>A-A</td>
<td>VG-VG</td>
<td>E-E</td>
<td>VG-VG</td>
<td>G-G</td>
</tr>
<tr>
<td>C7</td>
<td>A-A</td>
<td>G-G</td>
<td>G-G</td>
<td>A-A</td>
<td>E-E</td>
</tr>
</tbody>
</table>
Three possible results?

- $O_2 \succ O_5 \succ O_3 \succ O_4 \succ O_6 \succ O_1$
- $O_2 \succ O_5 \succ O_3 \succ O_4 \succ O_6 \succ O_1$
- $O_2 \succ O_5 \succ O_3, O_4 \succ O_6 \succ O_1$

1. Intersection between $C_1 - C_6$ and $C_7$.
2. Lexicographic aggregation of $C_1 - C_6$ and $C_7$.
3. Weighted majority rule on $C_1 - C_7$. 
This is the End!

- Supporting the Decision Process and not the Decision.
- Ownership of the model and the results.
- Theoretical Soundness and Operational Completeness.
- Easy Implementation
- Organisational Legitimation

Supporting the Decision Process and not the Decision.
Ownership of the model and the results.
Theoretical Soundness and Operational Completeness.
Easy Implementation
Organisational Legitimation

Supporting the Decision Process and not the Decision.
Ownership of the model and the results.
Theoretical Soundness and Operational Completeness.
Easy Implementation
Organisational Legitimation

This is the End!

- Supporting the Decision Process and not the Decision.
- Ownership of the model and the results.
- Theoretical Soundness and Operational Completeness.
- Easy Implementation
- Organisational Legitimation

This is the End!

- Supporting the Decision Process and not the Decision.
- Ownership of the model and the results.
- Theoretical Soundness and Operational Completeness.
- Easy Implementation
- Organisational Legitimation