



# QUIXOTE: Supporting group decisions through the Web

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ESF-TED Programme



Universidad  
Rey Juan Carlos

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# Agenda

- The TED programme
- The TED architecture
- CSOTE
- Discussion

# Introduction

- Information technology provides tools that may facilitate and (even) transform democracy
- We could view Internet as an opportunity to reduce the gap between governors and citizens
- E-democracy might contribute to the approximation of the public decision making to the citizen.
- There is a increasing demand for participation in public processes.

# OPINIONS IN FAVOR

- Brzezinski (America in the technotronic era)

*We should increasingly ensure citizen participation in decision making*

- Morris (Vote.com)

*As direct democracy takes root, the American voter will become more involved and active. We don't have to wait anymore for the next election to express our view while the Congress makes decisions for us. We don't have to wait for a call from a pollster to speak our piece. We are going to take the Internet and tell our representatives what to do whenever we damn well feel like it.*

# OPINIONS AGAINST

- Sunstein (REPUBLIC.COM)

*If I only listen those in my tribe, my decision is made beforehand*

- Bobbitt (The Shield of Achilles)

*Technology is killing democracy*

- *Shenk (Data Smog)*

*Ninth law of data smog: The electronic town hall allows for speedy communication and bad decision making*

- *Gates (The road ahead)*

*The art of governing evolves through informed decision making to assign resources. Devoting all his time to it is the job of the politician and allow the best politicians to think about and offer nonobvious solutions, which ordinary people might not even be able to understand, as they would not comprehend the sacrifices required to attain long-term success*

# IN BETWEEN TED

- Levy (Collective Intelligence)

*It's not a matter of allowing masses of individuals to vote instantaneously on simple questions posed by demagogues, but to promote their cooperative solution, as close as possible to concerned groups*

*This virtual agora will facilitate navigation and orientation through knowledge and favour its exchange, will offer dynamic visualisations of collective situations, will allow real time multiple criteria evaluations of many decision making processes.*

# TOWARDS ELECTRONIC DEMOCRACY (TED) PROGRAM



Facilitating decision analysis methods through the mechanisms of the web

8 countries

<http://www.esf.org/ted>

**Democracy**

methods of decision analysis  
group decision support

**IT**

**MORE PARTICIPATION**  
**e-Democracy**

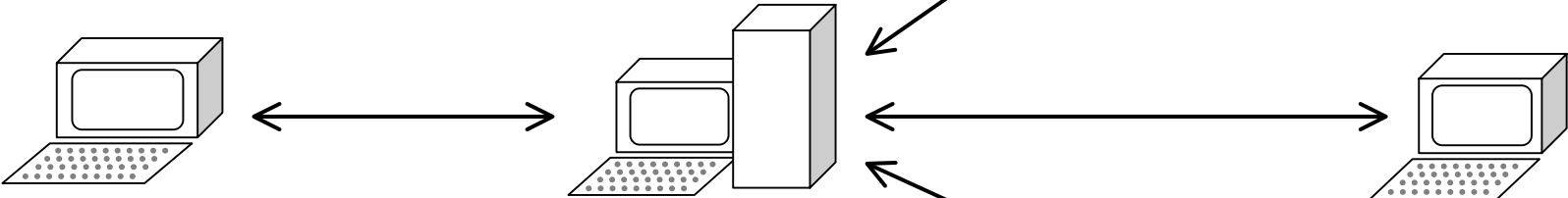
support



Increasing demand for participation in public decision processes

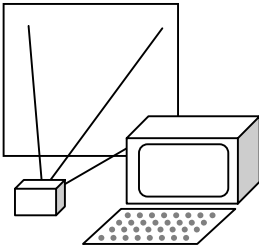
# Group decision making support

**Master system controlling decision modelling. This is the system on which the decision analysts will work.**



**Web server allowing different stakeholders to see decision model from their perspectives.**

**Computer projection of model for consultation with stakeholder group(s)**



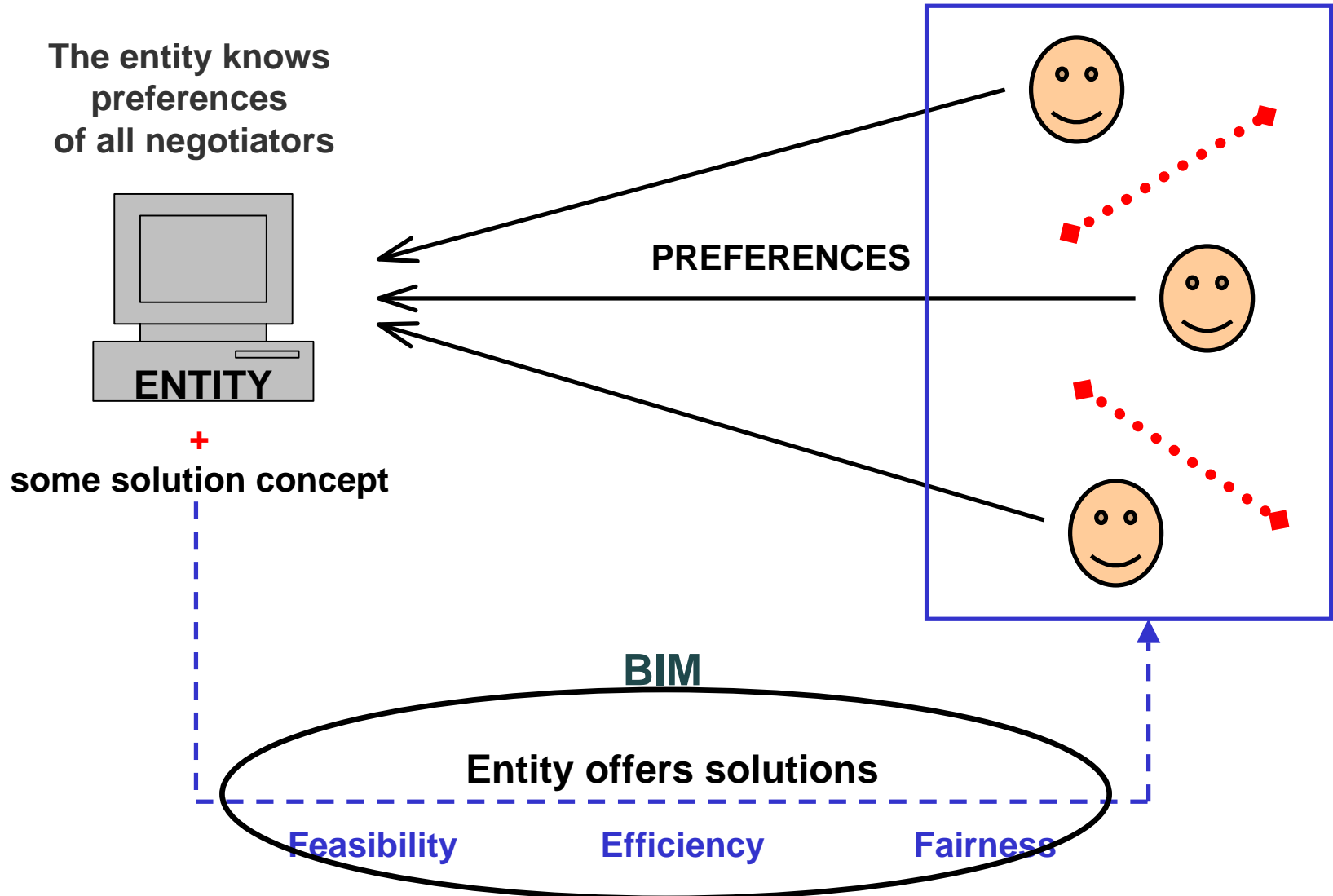
**Browsers on public and stakeholder machines to allow individual exploration of the models**

# System Modules

- Problem structuring
- Preference modelling
- Problem solving for each individual
- Arbitration solving
- Negotiating
- Voting
- Post-settlement.

All integrated in a web-based infrastructure

# Multilateral Negotiating Module



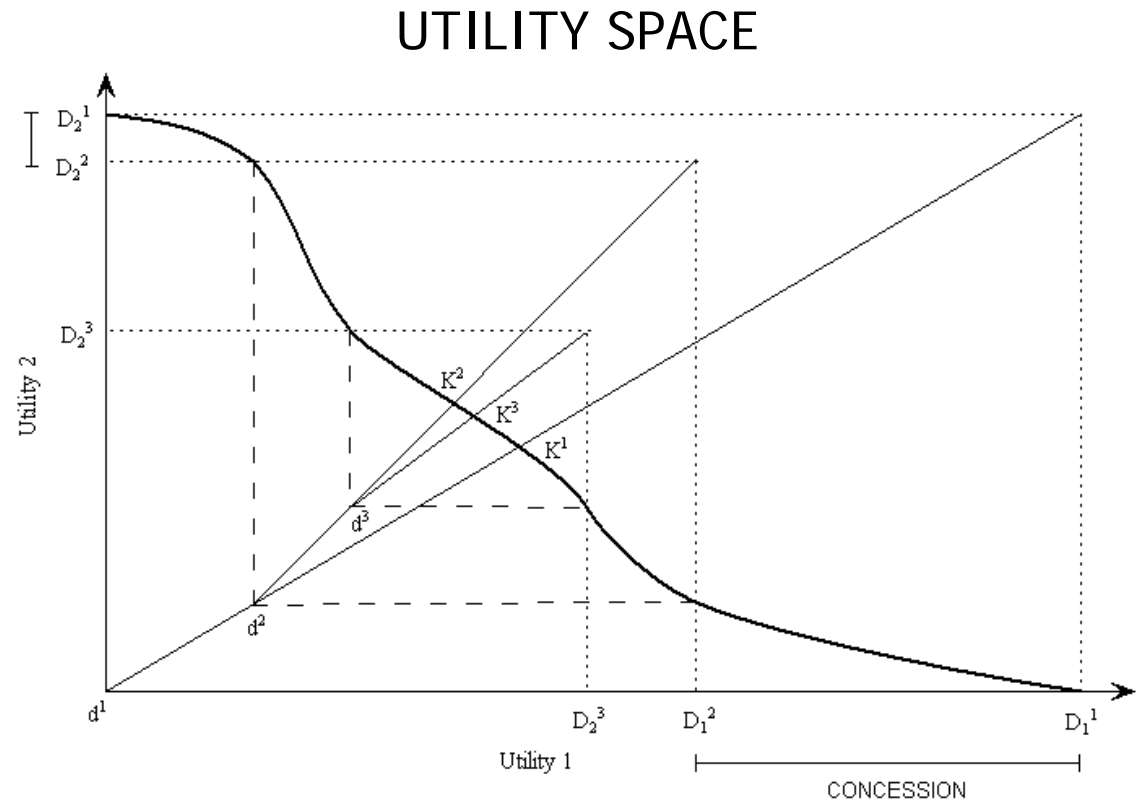
# Negotiation methods

- Different methods developed to support negotiations
  - Concession based methods (Interneg)
    - exchange of message and offers
  - Joint gains methods (Decisionarium)
  - Based on fairness approaches (TED)
    - balanced increment method
    - balanced concession method



# BIM: first steps

- Desirable properties of a negotiated solution:
  - Feasibility
  - Efficiency
  - Fairness



# TED - Towards Electronic Democracy

## Internet Based Complex Decision Support



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Tools

Preference Modeling

Influence Diagrams

Negotiation Tools

Voting Tools

Steering Committee

Participants

MailList & Register

Useful Links

### What's TED?



is an expectation that our democratic institutions will evolve into the new Information Society.

Despite the excitement brought by the technology, many of the current visions for its use are almost entirely conventional: political discussion and debate may become more inclusive of all the electorate through the growth of electronic discussion forums; opinion polling easier, faster and cheaper via the web; voting may not involve a cross on a piece of paper, but rather a click on a web-site or the sending of a text message. To a large extent e-democracy is simply envisioned as articulating the political and democratic procedures of the nineteenth and twentieth centuries through the mechanisms of modern information and communications technology. Yet there are mechanisms that enable a much more substantive implementation of democratic ideals. It is now possible for the public to be involved in societal decision making in many more ways. It is this broader vision that the TED programme will explore.

Our intention is to draw on the modern methods of decision analysis and group decision support, deployed over the WWW, in order to involve the public in decisions that affect them. More than electronic referenda, our vision sees stakeholders helping to shape options, sharing perspectives, discussing and evaluating *pros* and *cons*, facing up to uncertainty and moving towards a balanced conclusion.

We envision, therefore, developments in:

- Problem structuring
- Uncertainty modelling
- Preference modelling
- Expected utility maximisation
- Sensitivity analysis
- Negotiation
- Risk assesment and communication of issues
- Development of a web based software infrastructure

For further details, download the [proposal](#) or our [brochure](#).

[Download proposal PDF](#)



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# System Modules

# System Modules

- Three basic types of users:
  - *Problem owner*
  - *Stakeholders* or participants
  - The administrator: decision analysis team
- Mediation type:
  - **Negotiation**
  - Arbitration
  - Voting
- Safety and secure validation mechanisms are available

# System Modules

- Problem structuring
  - This module allows the problem owner to build an influence diagram to structure the decision making problem
  - The stakeholders will use such structure to explore issues concerning the problem.

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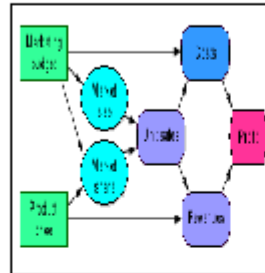


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### What's IDS?



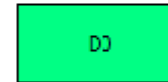
### What's Influence Diagrams Solver

Ids is a visual tool to creation, analysing, and communication decision models.

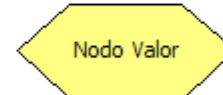
An influence diagram is a simple visual representation of a decision problem. Influence diagrams offer an intuitive way to identify and display the following elements:

#### Elements: What's do the nodes shape mean?

**Decision nodes:** Usually drawn as rectangles (such as node *Invest* above), represent variables that are under control of the decision maker and model the decision alternatives available to the decision maker.



**Deterministic node:** Usually drawn as hexagons represent utilities associated with consequences related with antecessors (decision and states of nature) of wide.



**Uncertainty node:** usually drawn as circles or ovals, represent unmoncitures present in the problem.



Read more



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# System Modules

- Preference modelling
  - Allows the users to build their preference model through a utility function and communicate it to the system confidentially.
  - Utility Function Assessment
    - Common properties of multiple objectives
      - number of attributes
      - their scale and range.
    - Assessment of each component value function.
      - with the probability equivalent method.
    - Assessment of the weights of the additive value function
    - Saving the value function for later purposes.

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#### Tools

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#### Steering Committee

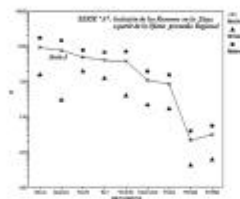
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## What's PM?

### Preference Modeling



PM is a tool to model multiattribute preferences through utility functions.

### Utility Function

$$U = F(\Phi(X_1, X_2, \dots, X_n))$$

$$\sum_{i=1}^n p_i x_i = 1$$

An **utility function** models the preferences and side attitudes decision maker are consequences associated with a decision problem.

Start by introducing the number attributes relevant in the decision problem. State the name of relevant attributes.



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## Utility Function

### Introduce the number of attributes

Start by introducing the number attributes relevant in the decision problem. State the name of relevant attributes.



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### Utility Function

Each line refers to an attribute. State its basic measurement step its range ( lower and upper limit ) and whether you prefer more of it ( e.g. salary ) or less of it ( eg., every consumption).

	Objective	Unit	Lower Limit	Upper Limit	More	Less
1	prize	Euros	0	6000	<input type="radio"/>	<input checked="" type="radio"/>
2	warranty	months	0	100	<input checked="" type="radio"/>	<input type="radio"/>

Send

\* Do you prefer a bigger or smaller quantity of the parameter?




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Study of the parameter:

Obtain with Probability

Probability	Consequence
<input type="text" value="50"/>	<input type="text" value="6000"/>
<input type="text" value="50"/>	<input type="text" value="0"/>

Indifferent

Obtain with Security

We are assessing your utility of the consequence below. You have to decide whether you prefer it for sure, you prefer the stated lottery in which you get the consequences with the stated probability or you are indifferent between them.



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# System Modules

- Individual problem solving
  - The users may find out their preferred course of action privately
  - Evaluating the influence diagram.

# System Modules

- Negotiating
  - Typically, various parties involved will reach different optimal solutions.
  - Through our negotiation module they try to reach an agreement.
  - BIM negotiation:
    - At each iteration of the algorithm, a solution is offered to participants and, if accepted, it stops, that being a consensus

# System Modules

- Voting module
  - If negotiations finish without an agreement
  - Voting rules available:
    - Plurality
    - Approval voting
    - Cumulative voting
    - Borda count

# CSOTE concepts in QUIXOTE

- Confidence and trust
  - Confidentiality of system data
  - Communications security
  - Data integrity
  - Accessibility
- Cryptographical methods to reach it
- Cryptographically Secure Open Truthful Exchange (CSOTE)

# Communications

- Comparison of participant's utility functions
  - Partial secret revealing techniques
- Verify users' information, preferences and actions publicly
  - Zero knowledge techniques

# Negotiation module

- Create groups with affinities in terms of their choices
  - Matching protocols
- Negotiate over objectives in a transparent manner
  - Selling of secrets techniques
- Condensate in an agent user requirements
  - Strong proxy signatures

# Voting module

- Transparency, capacity to verify the votes and capacity to avoid vote dealing
- Tamper-Proof Randomizer (TPR)
  - No need of reliable third parts
  - Prove correctness of the process
  - Proofs and final vote signed digitally

# Summary

- TED programme
- TED architecture
- Trust and security
- CSOTE
- Implementation continues
- Test (other than participatory budget)