Group Decision Support Systems: GRoUp System (GRUS)
Group Decision Support Systems

• “... mix of devices, software, persons, processes, allowing collaboration among group of persons.” (Sprague and Carlson, 1982)

• ...mix of computers, communications, technologies of decision working together to support problems identification, formulating and generating solutions during work meetings.” (DeSanctis and Gallepe, 1987)
GDSS Advantages

• Improve groups efficiency
• Reduce time consumption
• Increase the number of good ideas
• Improve group cohesion
• Improve problem definition
• Lead to good group commitment
Kinds of GDSS

- Decision Rooms
- Web Systems
Facilitation - Definitions

• Important impact on the group outputs and productivity

• “...activities done, before, during and after a collective decision meeting to support the group to reach their objectives defined during the decision process.” (Bostrom, Anson and Clawson, 1993)

• “… defined as a process through which an external person of the group, non concerned by the decision, officially recognized and accepted by the group, is employed to support a group engaged in a decision making process.” (Adla, 2010)
Kinds of Facilitation

• Technical
  • Assist stakeholders with the technology use

• Process
  • Moderate the stakeholders and their interactions in the tasks achievement in order to make arising the meeting objectives, and to guide the participants

• Content
  • Imply to directly deal with the problem to solve
Tools for Facilitation

- **Content oriented**
  - Dynamical Text Guide in a Multi-Criteria GDSS
  - Cooperative Knowledge Based System
  - Automatic ideas clustering
- **Process oriented**
  - Agent Based System
  - Group activity analysis (indicators analysis)
  - Facilitation Process
- **Difficulties to agree on common criteria used for Decision Making**
Facilitation Process

GROUP FACILITATION PROCESS

<table>
<thead>
<tr>
<th>PRE MEETING</th>
<th>DURING MEETING</th>
<th>POST MEETING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creating Agenda</td>
<td>Selecting participants</td>
<td>Presenting solution</td>
</tr>
<tr>
<td>Selecting participants</td>
<td>Generating alternatives</td>
<td>Reporting</td>
</tr>
<tr>
<td>Generating alternatives</td>
<td>Organizing alternatives</td>
<td></td>
</tr>
<tr>
<td>Organizing alternatives</td>
<td>Evaluating alternatives</td>
<td></td>
</tr>
<tr>
<td>Evaluating alternatives</td>
<td>Choosing solution</td>
<td></td>
</tr>
<tr>
<td>Choosing solution</td>
<td>Presenting solution</td>
<td></td>
</tr>
<tr>
<td>Presenting solution</td>
<td>Reporting</td>
<td></td>
</tr>
</tbody>
</table>

Creating Agenda
Selecting participants
Generating alternatives
Organizing alternatives
Evaluating alternatives
Choosing solution
Presenting solution
Reporting
MCDM Group Decision Making

- GDSS: Promethee
- Decision Makers
  - Individual Preferences
    - Private Criteria
    - One performance matrix by Decision Maker
- Global aggregation for the group ➔ Weighted Sum
- Advantage: Sensitive Analysis among Stakeholders
- Limit: No Collaboration, No Co-Decision, No Common Share
GRoUp System (GRUS)

» Web Application : ToolBox
  > Raphael Chatellet
  > Adama Coulibaly
  > Morteza Yazdani
  > Collaboration Jacqueline Konate – Université Bamako Mali

» Based on Grails web application framework
  > Open Source Framework

» GRUS is a fully open source system : available upon request
GRUS Features 1/2

» Can be used in several situations

<table>
<thead>
<tr>
<th>Same Time</th>
<th>Different Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Same Place</td>
<td>Same Place</td>
</tr>
<tr>
<td>(Synchronous and collocated)</td>
<td>(Asynchronous and collocated)</td>
</tr>
<tr>
<td>Indifferent to Time</td>
<td>Indifferent to Place</td>
</tr>
<tr>
<td>Same Time</td>
<td>Different Time</td>
</tr>
<tr>
<td>Different Place</td>
<td>Different Place</td>
</tr>
<tr>
<td>(Synchronous and distributed)</td>
<td>(Asynchronous and distributed)</td>
</tr>
</tbody>
</table>

» In GDSS, 2 roles of user

> One facilitator (meeting manager)
> Several Participants (meeting contributors)
GRUS Features 2/2

» 2 kinds of meetings are available
  > Public meetings
    + All registered users in GRUS system can participate
  > Private meetings
    + Only invited users can participate to a private meeting

» Some collaborative tools are available
  > Electronic Brainstorming
  > Categorizer
  > Vote
  > Agenda
  > Report...

» User with the role of facilitator can for her/his meeting
  > Define the meeting type
    + Group process (sequence of collaborative tools)
  > Invite users
  > Manage the group process (stop, add, delete,...) tools
GRUS Objectives

» Open System for
  > Sharing collaborative tools
  > Sharing group processes

» Promote the use of GDSS in organizations
» Improve the efficiency of group work
GRUS as a Tool-Box

- Several tools
- Combine them
- Flexible process
GRUS: Process oriented

- **Process**
  - Several steps
  - Several tools
  - Dynamically updated
    - Add / Remove stakeholders
    - Add / remove steps

<table>
<thead>
<tr>
<th>test3</th>
<th>▶ parameters ▶ criteriaAlternativesGeneration ▶ criteriaReduction ▶ alternativesReduction ▶ multicriteriaClusterEvaluation ▶ directChoiceCluster ▶ reportingCluster</th>
</tr>
</thead>
<tbody>
<tr>
<td>test</td>
<td>▶ parameters ▶ retour</td>
</tr>
<tr>
<td>test01</td>
<td>▶ parameters ▶ brainstorming ▶ vote</td>
</tr>
<tr>
<td>test2</td>
<td>▶ parameters ▶ criteriaAlternativesGeneration ▶ multicriteriaEvaluation ▶ directChoice ▶ retour ▶ reporting</td>
</tr>
<tr>
<td>testttt</td>
<td>▶ parameters ▶ criteriaAlternativesGeneration ▶ vote</td>
</tr>
<tr>
<td>testoooooooooo</td>
<td>▶ parameters ▶ criteriaAlternativesGeneration ▶ vote ▶ consensusB</td>
</tr>
<tr>
<td>test_argentine</td>
<td>▶ parameters ▶ criteriaAlternativesGeneration ▶ multicriteriaEvaluation ▶ vote ▶ feedback ▶ reporting</td>
</tr>
<tr>
<td>Tomato_Schedule</td>
<td>▶ parameters ▶ criteriaAlternativesGeneration ▶ alternativesReduction ▶ multicriteriaClusterPrivateEvaluation ▶ multicriteriaClusterEvaluation ▶ directChoiceCluster ▶ feedback ▶ conclusion ▶ reportingCluster</td>
</tr>
<tr>
<td>Vote - Etape 1 - ER</td>
<td>▶ consensusB</td>
</tr>
</tbody>
</table>
MCDM Processes

Weighted Sum
Choquet Integral

- **Parameters**
  - Facilitator
  - Stakeholders
  - Weight

- **Brainstorming**
  - All
  - Criteria and Alternatives Definition

- **Individual Preferences**
  - All
  - MCDA Matrix

- **Consensus**
  - Facilitator
  - Results Display

- **Decision**
  - Facilitator
  - Decision

- **Report**
  - Facilitator
  - File report

Criteria

- Suitability Function
  - Scoring Scale
  - Indifference Score
  - Reject Score
  - Shape of Interpolation
  - Shapley Indice (Bi-Capacity)

(a) linear improvement of the suitability
(b) sigmoide improvement of the suitability
(c) plateau improvement of the suitability
Vote Processes

- **Parameters**
  - Facilitator
  - Stakeholders
  - Weight

- **Brainstorming**
  - All
  - Alternatives
  - Definition

- **Individual Preferences**
  - All
  - Ranked
  - Alternatives

- **Consensus**
  - Facilitator
  - Display
  - Results

- **Decision**
  - Facilitator
  - Decision

- **Report**
  - Facilitator
  - File report

Borda Condorcet
Proposed Methodology

• Sharing information for Co-decision Processes
• 2 levels of preferences
  • Common Criteria discussed among the stakeholders
  • Individual Criteria
GRUS: Creation of a New Process

Create Process

Title: My 1st process

Choose your tools:
- clustering
- vote
- brainstorming
- consensus

Filter

Create
### Individual Preferences

**Topic: Selection of PhD Student**

**Vote**

Please introduce performances for each alternative

<table>
<thead>
<tr>
<th>Alternatives</th>
<th>Age</th>
<th>Cursus</th>
<th>Publications</th>
</tr>
</thead>
<tbody>
<tr>
<td>John</td>
<td>18</td>
<td>18</td>
<td>15</td>
</tr>
<tr>
<td>John</td>
<td>14</td>
<td>10</td>
<td>18</td>
</tr>
<tr>
<td>Helena</td>
<td>14</td>
<td>13</td>
<td>10</td>
</tr>
</tbody>
</table>

**Example: PhD Student selection**
Individual Preferences

Weight and preference function

Please introduce the weight and the parameters for the preference function for each criterion.

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Mark</th>
<th>Minimum</th>
<th>Desired</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>12</td>
<td>1</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Cursus</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Publications</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Example: PhD Student selection

RUC-APS – www.ruc-aps.eu
## Individual Preferences

### Dependency between criteria

*Please introduce the dependency between the criteria*

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Age</th>
<th>Cursus</th>
<th>Publications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>Cursus</td>
<td></td>
<td></td>
<td>14</td>
</tr>
<tr>
<td>Publications</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Example:** PhD Student selection

Objectif(s): We have to choose one candidate among three for a PhD Position.
# Criteria Aggregation

## Topic: Selection of PhD Student

### Consensus

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Average</th>
<th>Standard deviation</th>
<th>Minimum</th>
<th>Desired</th>
<th>Maximum</th>
<th>Authorized minimal performance</th>
<th>Authorized maximal performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>12</td>
<td>0</td>
<td>1</td>
<td>20</td>
<td>20</td>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td>Summary of the weights attributed by the decision-makers</td>
<td>Global preference</td>
<td>Tolerated minimal and maximal performances</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

--- The importance of the criterion --Age-- in the model: 1.198

Example: PhD Student selection
## Final Ranking

### Summary of the mark for the alternatives

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Global mark obtained by integral of Choquet</th>
<th>Global mark obtained by balanced sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>John</td>
<td>1.44</td>
<td>1.8</td>
</tr>
<tr>
<td>Helena</td>
<td>0.9</td>
<td>1.5</td>
</tr>
</tbody>
</table>

Example: PhD Student selection
Toulouse – Waterloo - Recife

• Cultural Effects

• Face to face

• 3 Experiments
  • Master / PhD Students
  • 3 sessions / 5 students
    • Toulouse
    • Waterloo
    • Recife

• Evaluated process:
  • Brainstorming
  • Clustering
  • MultiCriteria Evaluation
  • Discussion
  • Report

• University of Waterloo
**PROJECT DESCRIPTION**

**Acronym:** RUC-APS

**Project name:** Enhancing and implementing Knowledge based ICT solutions within high Risk and Uncertain Conditions for Agriculture Production Systems

**Call:** H2020 RISE-2015

**Time:** 2016-10-03/2020-10-02 (48 months)

**Coordinator:** The University of Liverpool, UK

**Total cost:** EUR 1 332 000

**Consortium:** 16 participants from 5 EU countries (France, Italy, Poland, Spain, and United Kingdom), and 3 partners from 2 third countries (Argentina and Chile)

- WP12
- Support Group Decision Processes
- Find the appropriate methodology
Experiments

• Simplify

• Synchronous / Distributed

• 15 Experiments
  • Non Academics / Academics

• Process
  • Parameters
  • Brainstorming
  • MultiCriteria Evaluation
  • Discussion
  • Report

• UT1C, France – UNLP, Argentina - 06/04/2018

Toulouse - UPS

La Plata – UNLP

Toulouse – UT1C

RUC-APS – www.ruc-aps.eu
The conservation of biodiversity currently represents a major challenge, since it impacts environmental, social, economical and other human activities features. Observation data may be needed at large spatial or temporal scales to encompass a wide range of situations in order to achieve meaningful results.

This implies that hundreds or thousands of observers need to be mobilized, at a cost which would be prohibitive if they had to be paid. Therefore, in this project we will define an R package offering a set of frequentist and bayesian statistical tools and observer behavior modeling to extract and visualize accurate and relevant data from the mass of opportunistic data (VGI data), in order to produce meaningful biodiversity indicators.

Moreover, since VGI systems do not provide advanced analysis tools, we will use Spatial OLAP to analyze those bioindicators. Since final users are different and numerous, we will define a new group decision-making SOLAP design methodology to implement Spatial OLAP models for bioindicators.

Projet PRCE (http://www.agence-nationale-recherche.fr/AAPG2017)

Challenge 1 « Gestion sobre des ressources et adaptation au changement climatique »

Application « Smart Monitoring » de l’axe 4 “Innovations scientifiques et tech.”

Orientation 1 “Suivi intelligent du système terre”

Budget 431 000 Eur

Durée 48 mois

Début: 1 Décembre 2017
Experiments

- Adapt methodology
- Synchronous / Distributed
- Experiment
  - 3 Ornithologists
  - 2 Facilitators
- Process: 5 sub-processes
  - Vote (Borda)
  - Vote (Borda)
  - MultiCriteria Evaluation
  - Vote (Borda)
  - Vote (Borda)

- Clermont-Ferrand, Bordeaux, Toulouse, Paris, Montpellier - France

<table>
<thead>
<tr>
<th>Utilisateur</th>
<th>En ligne/Hors ligne</th>
<th>Terminé/Non terminé</th>
</tr>
</thead>
<tbody>
<tr>
<td>pas2</td>
<td>En ligne</td>
<td>Pas fini</td>
</tr>
<tr>
<td>Pascia</td>
<td>En ligne</td>
<td>Pas fini</td>
</tr>
<tr>
<td>pas3</td>
<td>Hors ligne</td>
<td>Pas fini</td>
</tr>
</tbody>
</table>

Gestion des utilisateurs:

Aucun anonyrat

Gestion de l'arborat:

Aucun pseudonyme

En fonction de l'intégralité de Choquiat:

Affichez

En fonction de la somme pondérée:

Affichez

<table>
<thead>
<tr>
<th>AbondanceJuV (0.277)</th>
<th>AbondanceJuV (0.34)</th>
<th>AbondanceJuV (0.32000087)</th>
<th>AbondanceJuV (0.25333333)</th>
</tr>
</thead>
</table>
Thank you!