PROMETHEE

METHODS

PROMETHEE-GAIA

How to choose the correct preference function

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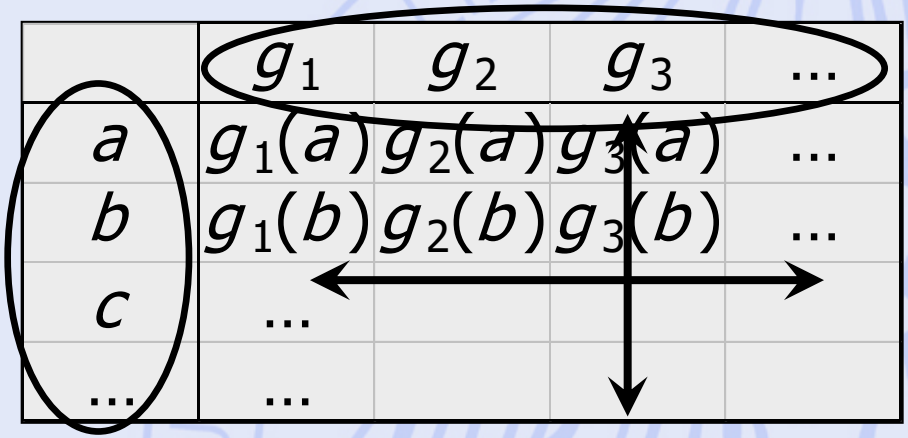
Modelling… 1… 2… 3…

1. Define actions

2. Define criteria



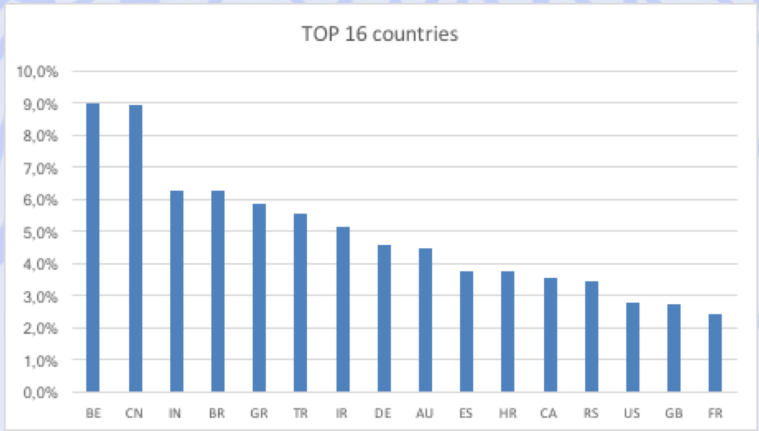
3. Model preferences

Why PROMETHEE?

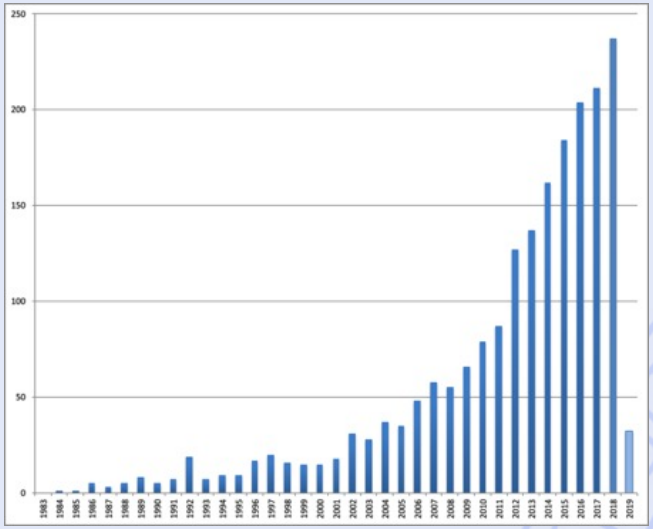
- Well established methodology:
  - 35 years of development,
  - Over 2200 papers published.
- « Simple ».
- Visual tools.
- Extended sensitivity analysis.
- Interactive.
- Software: **Visual PROMETHEE**.

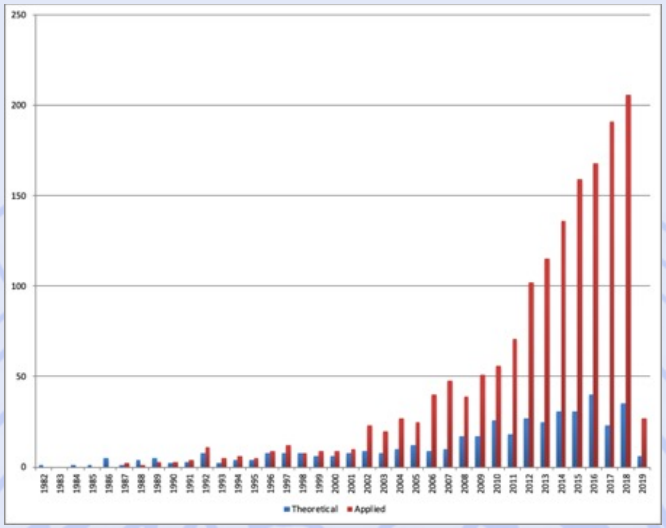
Some statistics…

- First presentation in 1982 by J-P. Brans.
- Over 2200 papers published.
- Main fields of application:
  - Environment
  - Industry
  - Services
  - Public sector
  - Energy
  - Finance



PROMETHEE Timeline





- Over 2200 published papers:
  - 80% applied – 20% theory
  - 57% in “societal” fields
- Median: 2014
- Over 4000 authors from 88 countries.

Principles of the PROMETHEE methods

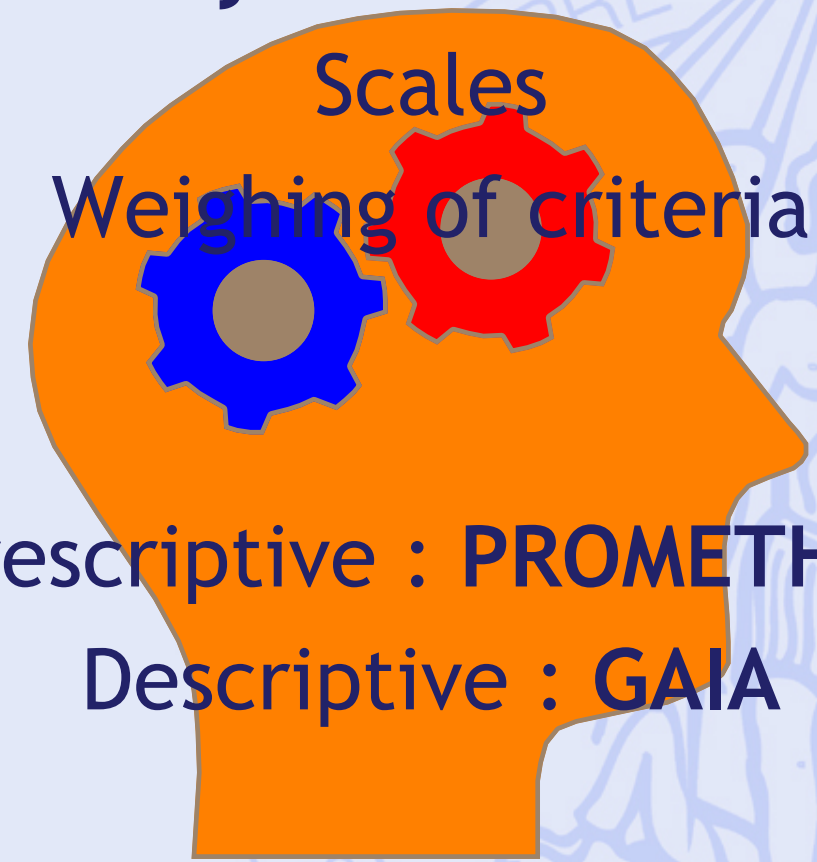
- Preference modelling:
  - Preference functions (scales),
  - Weighing of criteria.
- Pairwise comparison of actions:
  - Outranking,
  - Prudent (partial ranking),
  - Partial compensation:
    - Advantage with respect to weighted sum and utility function.

Modelling with PROMETHEE

- **Supplementary information:**

  Scales

  Weighing of criteria



- **Analysis:**

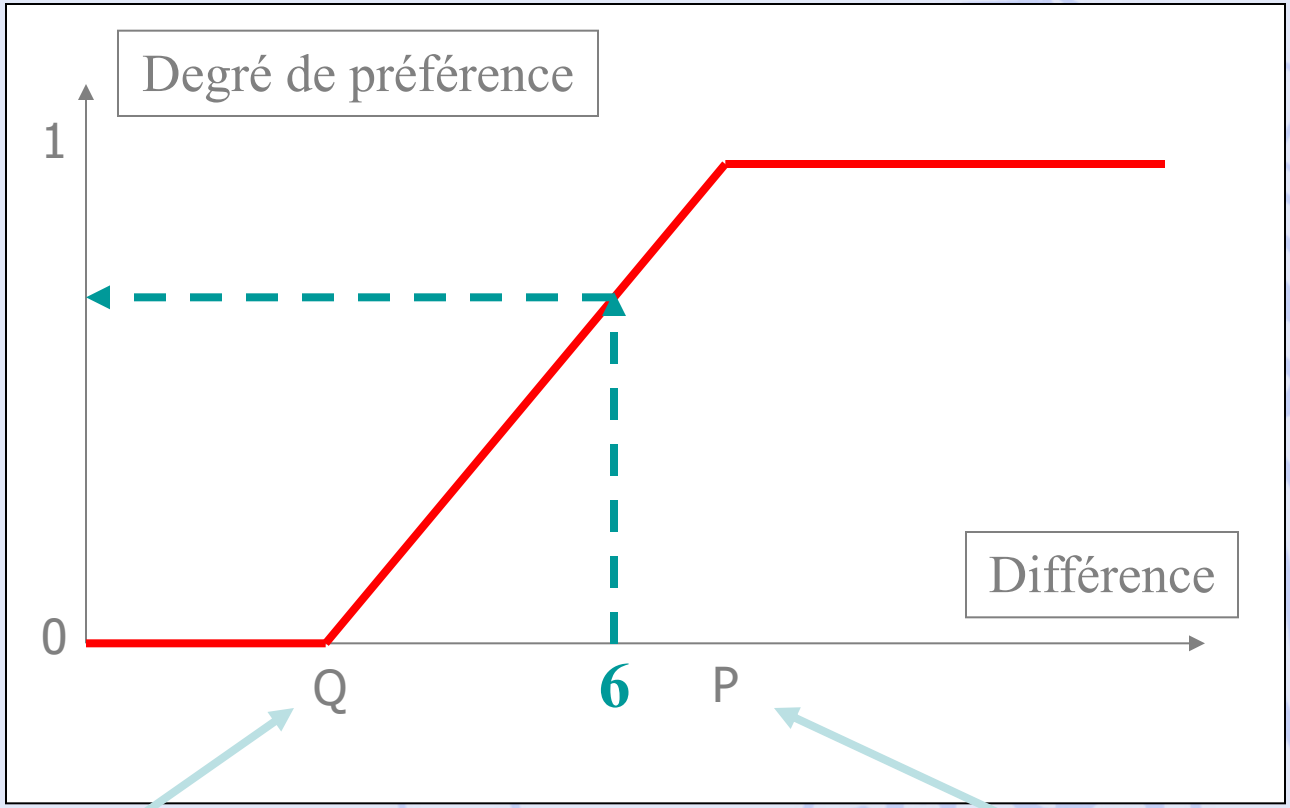
  Prescriptive : **PROMETHEE**

  Descriptive : **GAIA**

Comparison of 2 actions

	Crit. 1 (/20)	Crit. 2 (quote)	Crit. 3 (apprec.)	Crit. 4 (Y/N)	…
Action 1	18	135	B	Yes	…
Action 2	9	147	Difference = 6		…
Action 3	15	129	TB	No	…
Action 4	12	146	TM	?	…
Action 5	7	121	B	Oui	…
…	…	…	…	…	…

Fonctions de Préférence



Indifference threshold

Linear

Preference threshold

PROMETHEE & GAIA Methods

- PROMETHEE: prescriptive
  - Partial ranking of actions
    - PROMETHEE I
  - Complete ranking of actions
    - PROMETHEE II
- GAIA: descriptive
  - Identification of conflicts between criteria.
  - Profiles of actions.
  - Set priorities, sensitivity analysis.

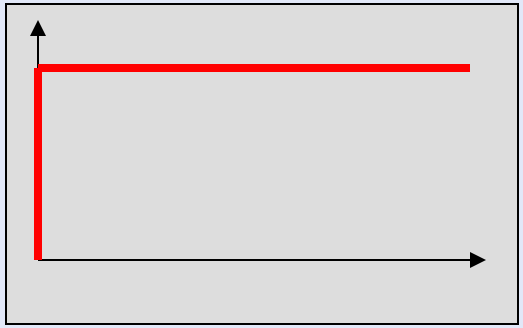
Using PROMETHEE

1. Define the actions:
   - Policies, products, projects, items, …
2. Define the criteria:
   - Quantitative,
   - Qualitative (scales).
3. Evaluate (multicriteria table).
4. For each criterion:
   - Choose a preference function type.
   - Assess the corresponding thresholds.
5. Weigh the criteria.

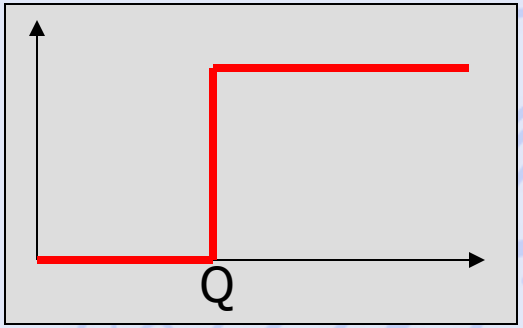
Qualitative & quantitative criteria

- Quantitative criteria:
  - Natural numerical scale.
- Qualitative criteria:
  - Ordinal scale (e.g. Likert scale).
  - Maximum 9 levels (7 ± 2) for consistency.
  - Neutral level?
  - Examples:
    - Very good, Good, Average, Bad, Very bad
    - Yes, No
    - ++, +, 0, -, --
    - ++, +, -, --
  - Underlying numerical scale (code).

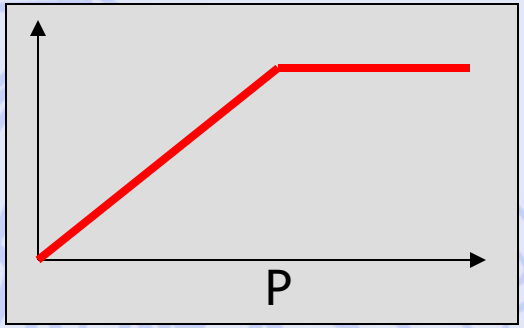
Preference functions
(as in Visual PROMETHEE)



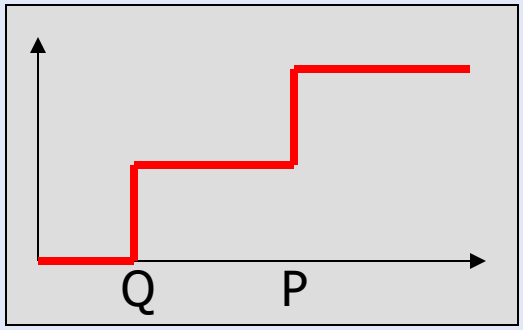
Usual



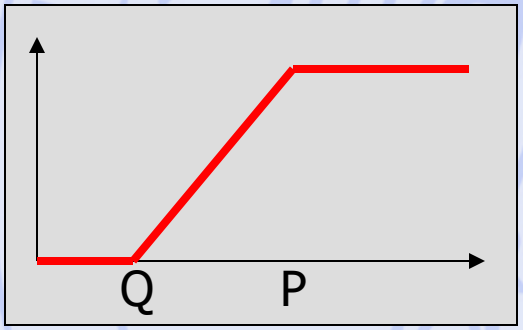
« U »



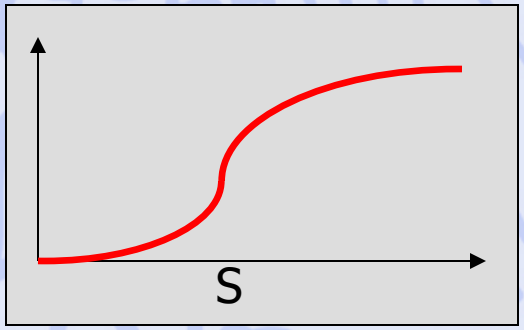
« V »



Level



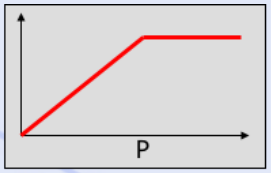
Linear



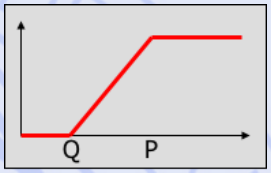
Gaussian

Preference functions

- Quantitative criteria « continuous » (ex. cost, price, distance):
  - « V » (no indifference threshold),
  - Linear.

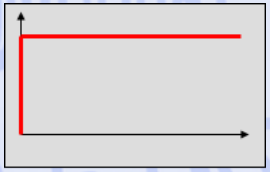


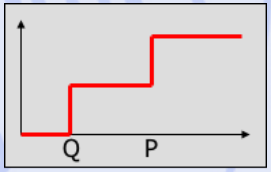
« V » shape



Linear

- Qualitative or « discrete » criteria (ex. « VG to VB », number of rooms):
  - Usual (no thresholds),
  - Level.


Usual



Level

Conclusion…

- First… الف شكر
- Continue…
- Consult and download:

  http://www.promethee-gaia.net
- Join the LinkedIn group "**PROMETHEE** decision aid methods"
- Come:
  - **PROMETHEE *Days* 2021** in Thessaloniki !

    http://www.prometheedays.com