# HOSPITAL DEPARTMENT PERFORMANCE EVALUATION USING THE PROMETHEE MULTICRITERIA METHODOLOGY

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# Summary

1. The problem.
2. A multicriteria approach with the PROMETHEE & GAIA methods.
3. Descriptive analysis.
4. Performance ratios analysis.
5. Global performance measurement.
6. Conclusions & Developments.

# Objective

- Compare different hospital departments based on activity and resources usage (data availability):
  - Administrative staff, paramedics, equipment, surface.
  - Turnover, net result, fees.
- Evaluate the relative performance level of the departments.

# Data

- Annual data (2008) for two Brussels hospitals:
  (Europe Hospitals group, 716 beds)
  - St-Michel hospital
  - Ste-Elisabeth hospital
- 31 departments.

# A multicriteria approach

- Why?
  - Several evaluation criteria to aggregate.
- Multicriteria Decision Aid (MCDA):
  - Compare and assess several actions that are evaluated on several criteria.
- Multicriteria model:
  - Actions: departments.
  - Criteria: activities, resources, ratios.

# PROMETHEE & GAIA methods

- Outranking methods.
- Pairwise comparison of actions.
- Closer to the decision problem.
- Simple preference modeling:
  - Preference functions (scales),
  - Weights (priorities).
- Prescriptive and descriptive:
  - PROMETHEE: ranking, net flow score,
  - GAIA: visual representation of actions and criteria.

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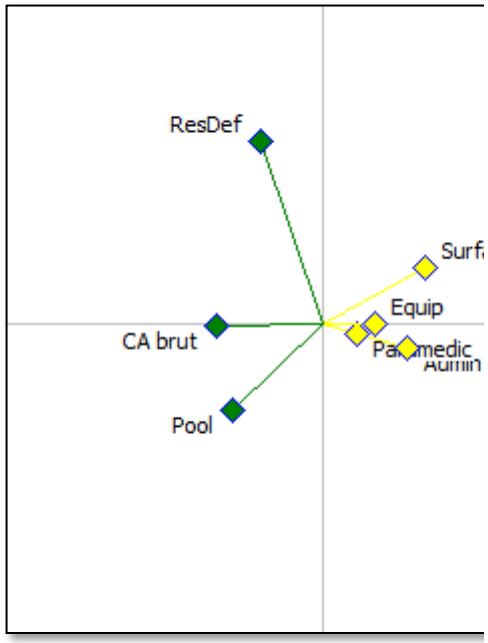


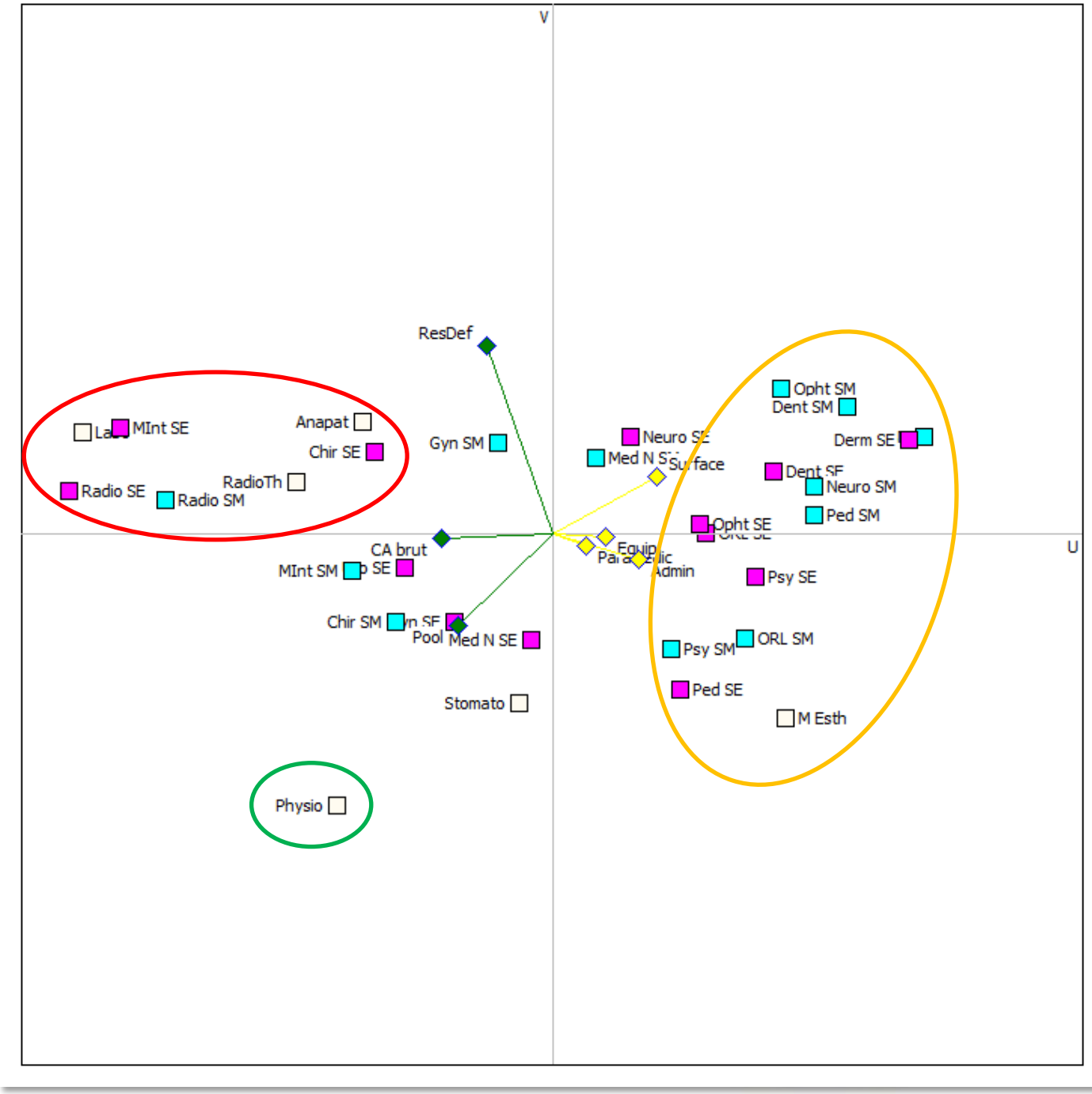


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# Performance analysis

- 6 criteria: performance ratios (output/input):
  - Turnover/m2
  - Turnover/staff
  - Turnover/equipment
  - Result/m2
  - Result/staff
  - Result/equipment

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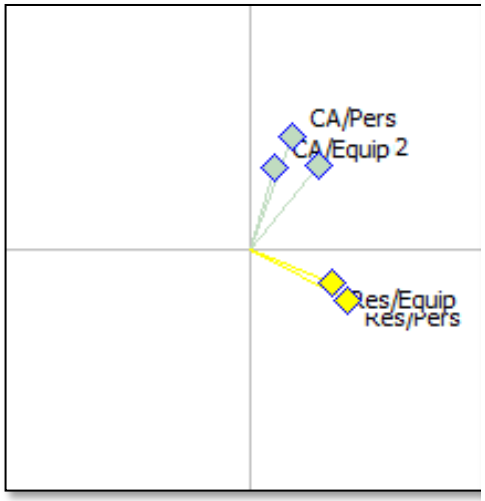



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# Focus on 7 “med-tech” departments

- Nuclear and molecular imaging (SE – SM)
- Anatomopathology
- Laboratory
- Radiology (SE – SM)
- Physiotherapy


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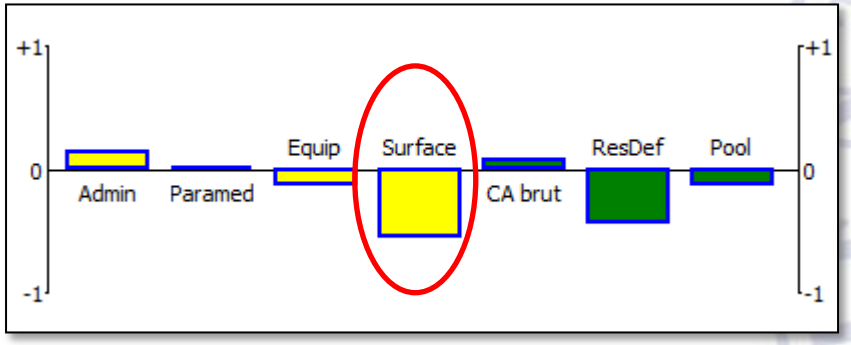
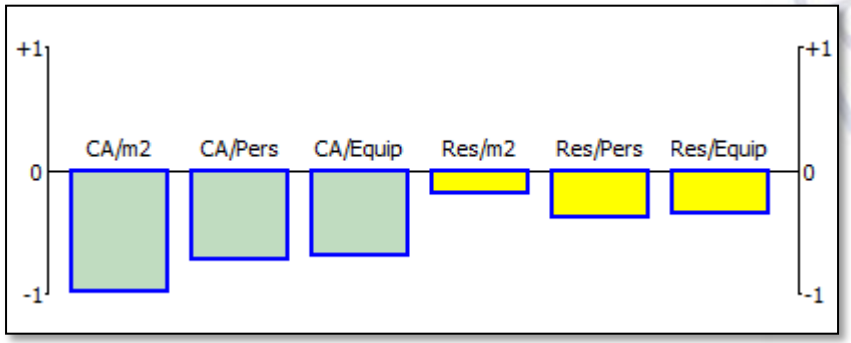
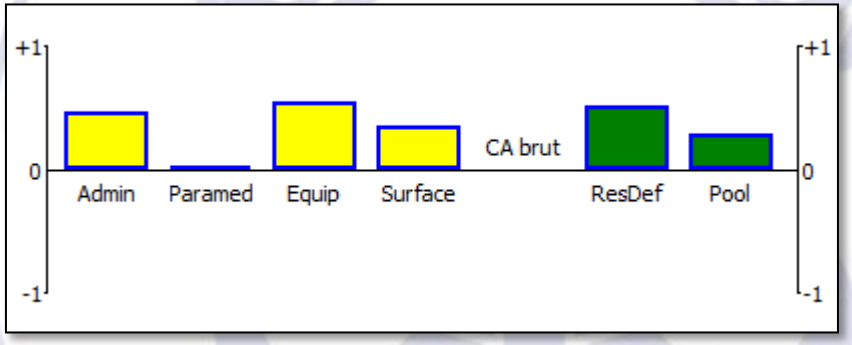
# Nuclear and molecular Imaging

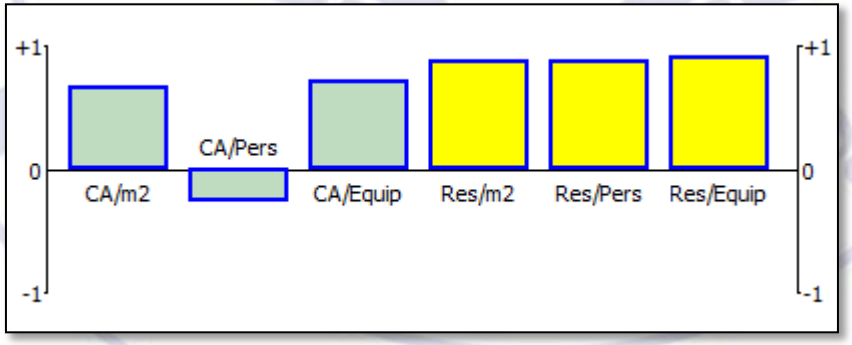
*Ste Elisabeth hospital*



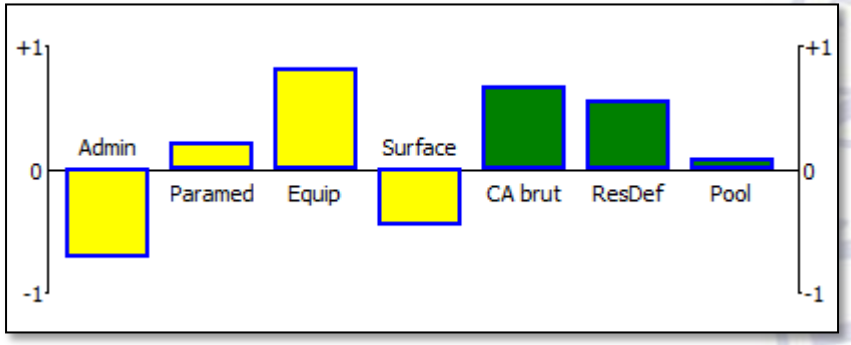

*St Michel hospital*

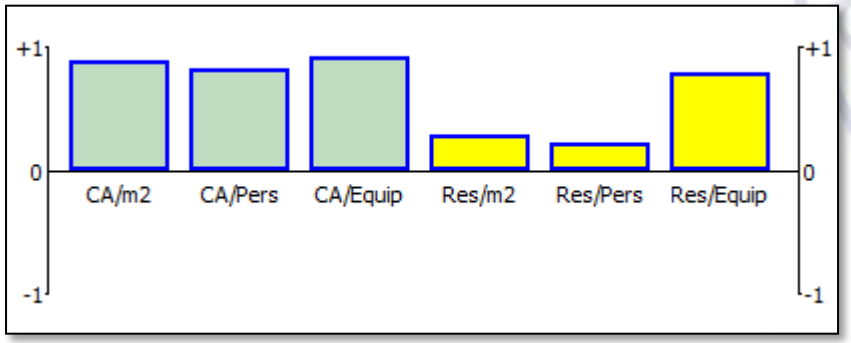


# Surgery

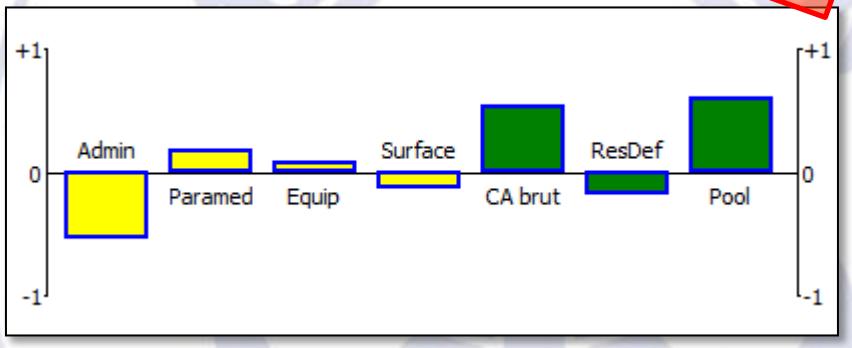
*Ste Elisabeth hospital*

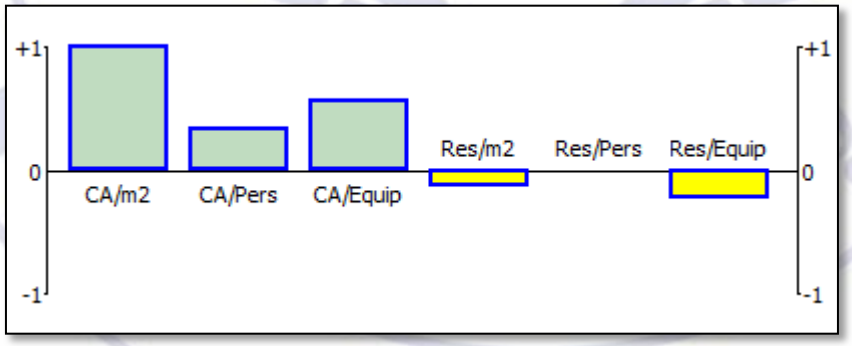



*St Michel hospital*

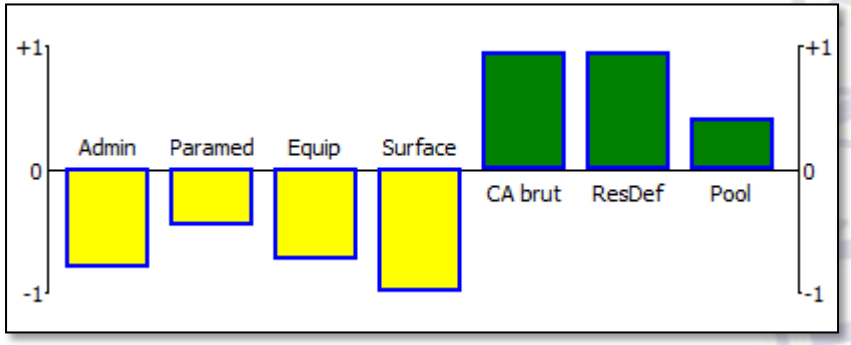
*Newer department*

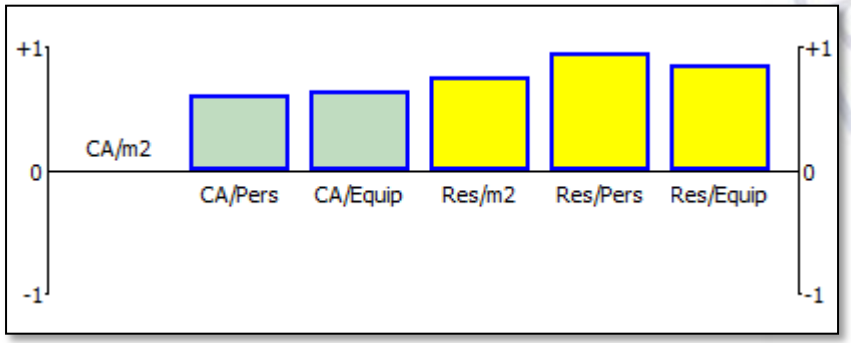


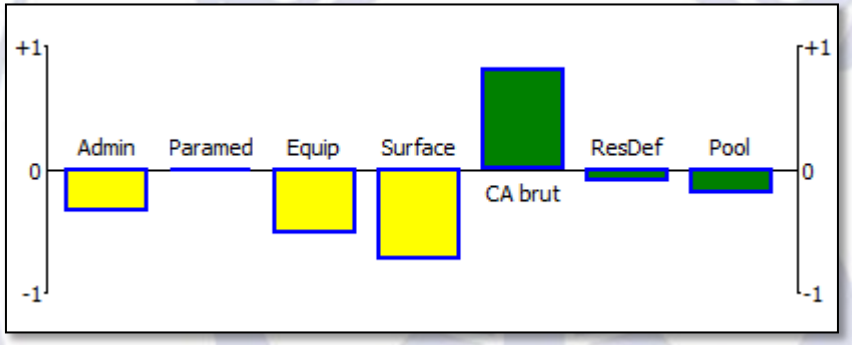
# Internal Medicine

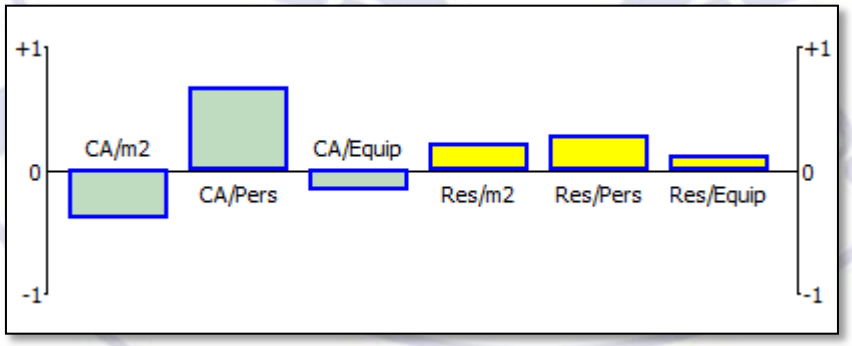
*Ste Elisabeth hospital*




*St Michel hospital*



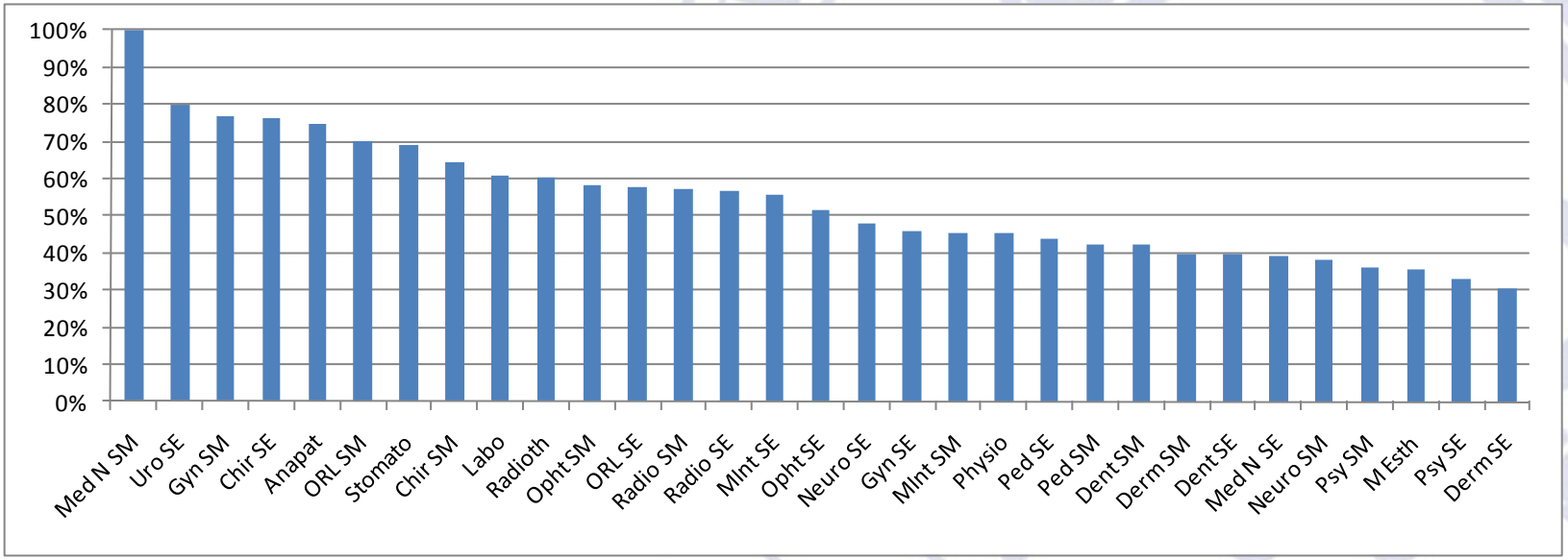



# Global Performance Measurement

- Based on PROMETHEE net flow score for two groups of criteria:
  - "Input" criteria (resources): $\phi^{IN}$
  - "Output" criteria (activities): $\phi^{OUT}$
- Multicriteria performance index:

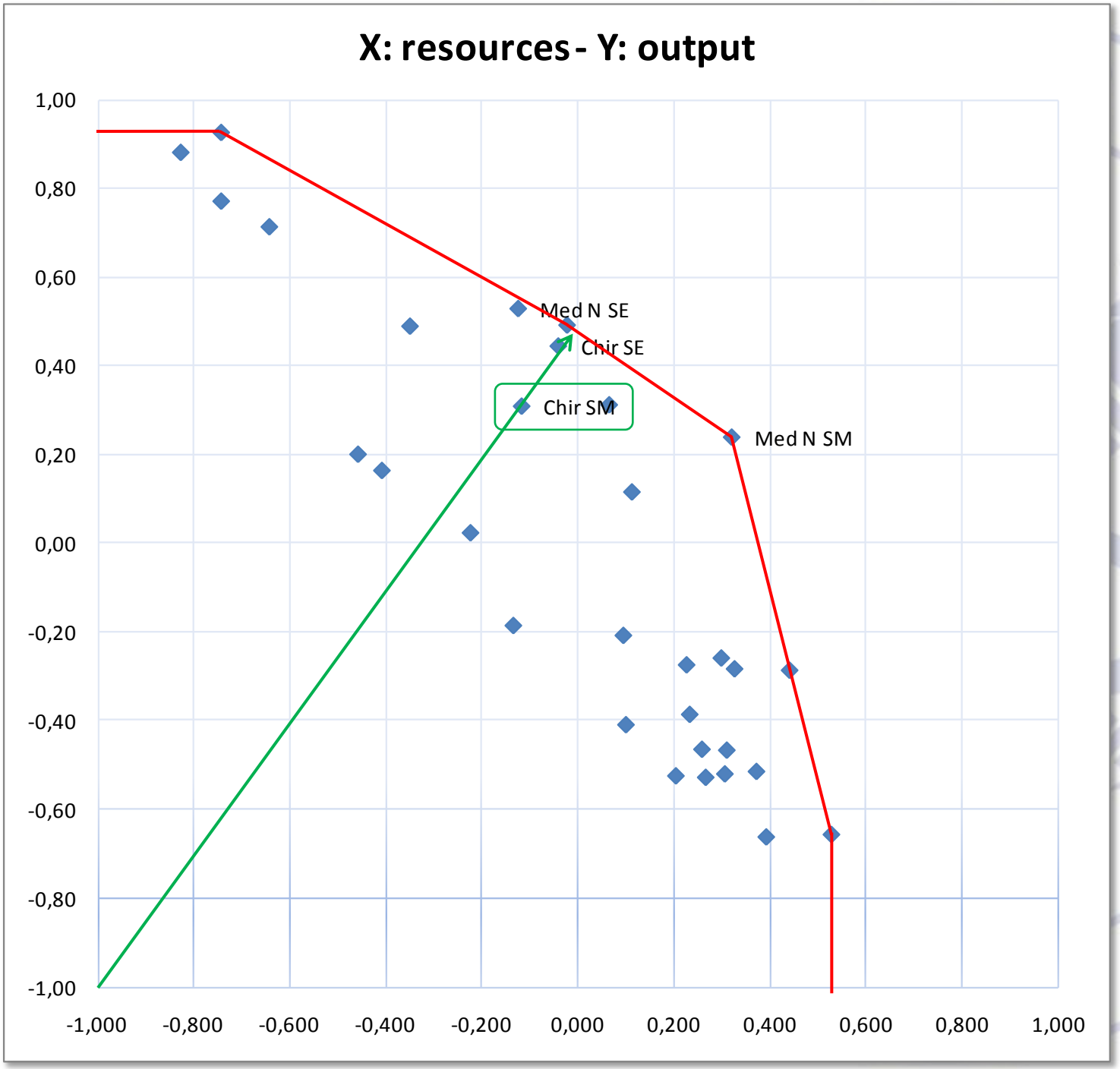
$$MPI(a) = \frac{1}{MPI_{\max}} \times \frac{\phi^{OUT}(a)+1}{1-\phi^{IN}(a)}$$

# Multicriteria Performance index



# “Input-Output” analysis

- 2 dimensional graphical representation of the departments.
- “Efficient” departments and “efficient” frontier.
- Determination of “reference” departments for improving the performance of non-”efficient” deparments: goals.


X: resources - Y: output
1,00
0,80
0,60
0,40
0,20
0,00
-0,20
-0,40
-0,60
-0,80
-1,00
-1,000
-0,800
-0,600
-0,400
-0,200
0,000
0,200
0,400
0,600
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Med N SM

# Conclusion and Future

- Multicriteria approach to performance evaluation:
  - Preference modeling: priorities (weights), sensitivity analysis (how to improve performance),
  - Visual representations (decision aid).
- Future developments:
  - Other evaluation criteria.
  - Other fields of application.
  - Software development.