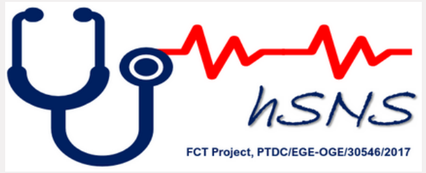
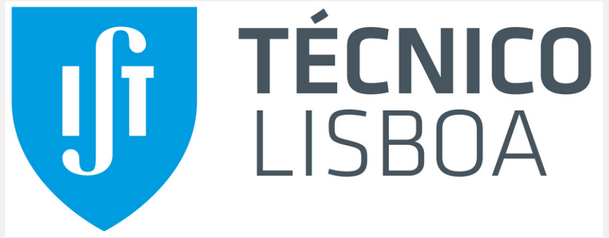
QUALITY ASSESSMENT OF THE PORTUGUESE PUBLIC HOSPITALS USING A MULTIPLE CRITERIA DECISION AIDING APPROACH

hSNS Workshop 2021





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CONTENTS

1. QUALITY IN HEALTHCARE SERVICES

It is vital to guarantee universal access to healthcare and to ensure that it follows safe and appropriate guidelines to provide quality health care (Gostin & Friedman, 2015), particularly nowadays with the COVID-19 (Sars-Cov-2) pandemic threatening our way of life and emphasizing pre-existing systemic issues (Okereke et al., 2020)

SERVICE'S QUALITY

SNS
SERVIÇO NACIONAL
DE SAÚDE

The Portuguese National Health Service (SNS) was created in 1979 to provide universal, equal, and tendentiously free care

Political and economic events have had an impact on the SNS

→

Healthcare policies focused on improving efficiency and reducing costs

→

Compromise infrastructures and equipment, and, above all, the service's quality

OUR APPROACH

Multidimensional nature of quality in health

Multiple Criteria Decision Aiding Approach (MCDA)

ELECTRE TRI-C/nC: (Almeida-Dias et al., 2010; 2012)

Quality assessment of the Portuguese public hospitals

2. CONSTRUCTING THE DECISION MODEL

DECISION AIDING PROCESS

Overview

PROBLEM FORMULATION

Problem design by the analyst and the decision maker (DM)

PREFERENCES

Elicitation of the preference parameters of ELECTRE TRI-C/nC

DECISION MODEL

Building decision models with data and parameters

OUTPUT

Results - output by using software (DecSpace & MCDA-Laval)

FINAL RESULTS

Robustness analysis and validation of the results by the DM

DECISION MAKER

A former expert from
the Ministry of Health,
who possesses know-how
in the healthcare sector
and performance assessment

ACTIONS

25

PORTUGUESE PUBLIC HOSPITALS

CRITERIA SET

COMPLEX CRITERIA TREE

DATA

Hospital benchmarking database for 2017 and 2018

ACSS ADMINISTRAÇÃO CENTRAL DO SISTEMA DE SAÚDE, IP

24 performance indicators

g1	g2	g3	g4	g5
Access	Care Appropriateness	Patient Safety	Efficiency	Caesarean Appropriateness
5 subcriteria	5 subcriteria	6 subcriteria	5 subcriteria	3 subcriteria

CRITERIA' SCALES

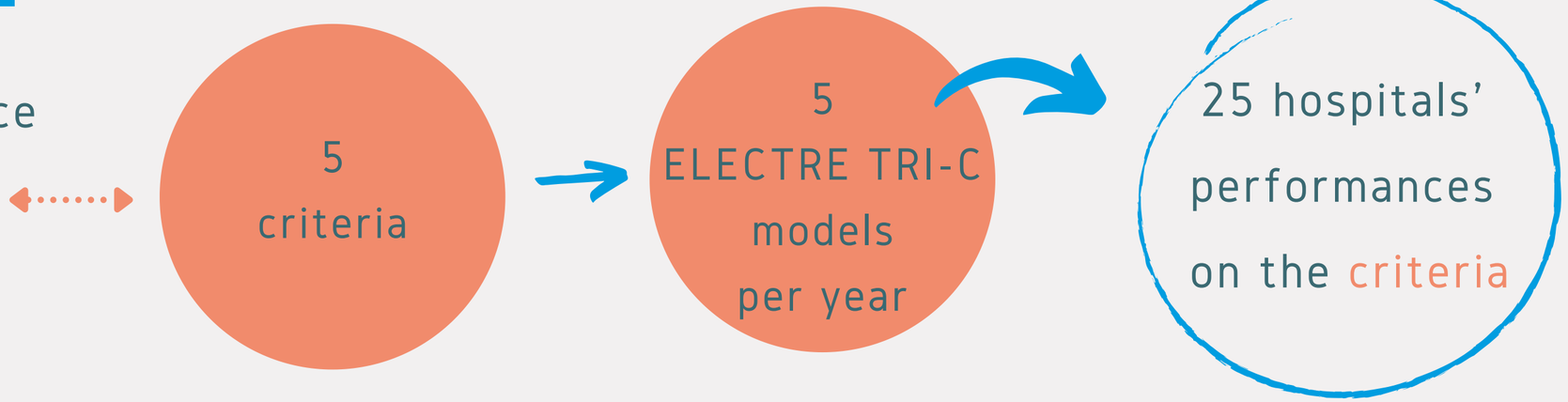
ELECTRE TRI-C:
An MCDA
sorting method

An innovative approach for
constructing the criteria’ scales

- ✓ Active intervention of the DM
- ✓ A qualitative scale for each criterion
- ✓ Imperfect data characteristics and arbitrariness
- ✓ No systematic compensation

CONSTRUCTING SCALES

25 hospitals' performance on the subcriteria (indicators)



STEPS

1. Define the levels for all the subcriteria
2. For each criterion, apply ELECTRE TRI-C to assess the hospitals according to the subcriteria
3. Convert the categories assessed in the previous step to each hospital to a level between 1 and 5 on an ordinal scale (unless the method had assessed an interval of categories) → C1 -> level 1

Lower-level view vs Upper-level view

...

C5 -> level 5

CATEGORIES

SCALE OF G2

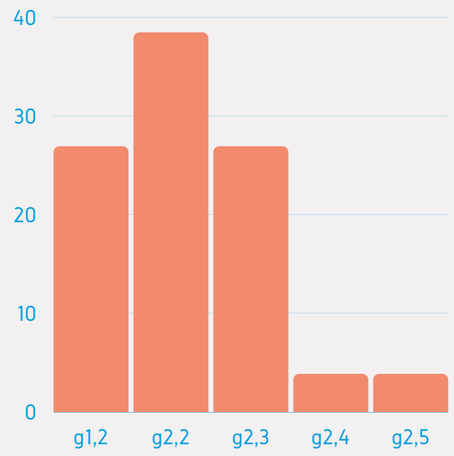
Reference hospitais for g2 - Care Appropriateness

Category	Performance	Reference hospital	Subcriterion				
			$g_{2,1}$	$g_{2,2}$	$g_{2,3}$	$g_{2,4}$	$g_{2,5}$
C_5	Very Good	b_5^1	90.00	5.00	2.70	90.00	0.50
C_4	Good	b_4^1	85.00	6.50	3.20	80.00	0.60
C_3	Neutral	b_3^1	80.00	7.40	3.70	50.00	0.90
C_2	Poor	b_2^1	75.00	8.30	4.50	30.00	1.10
C_1	Very Poor	b_1^1	70.00	9.80	5.20	20.00	1.40

+ Indifference and preference thresholds

+ Credibility level = 0,6

+ Weights of subcriteria

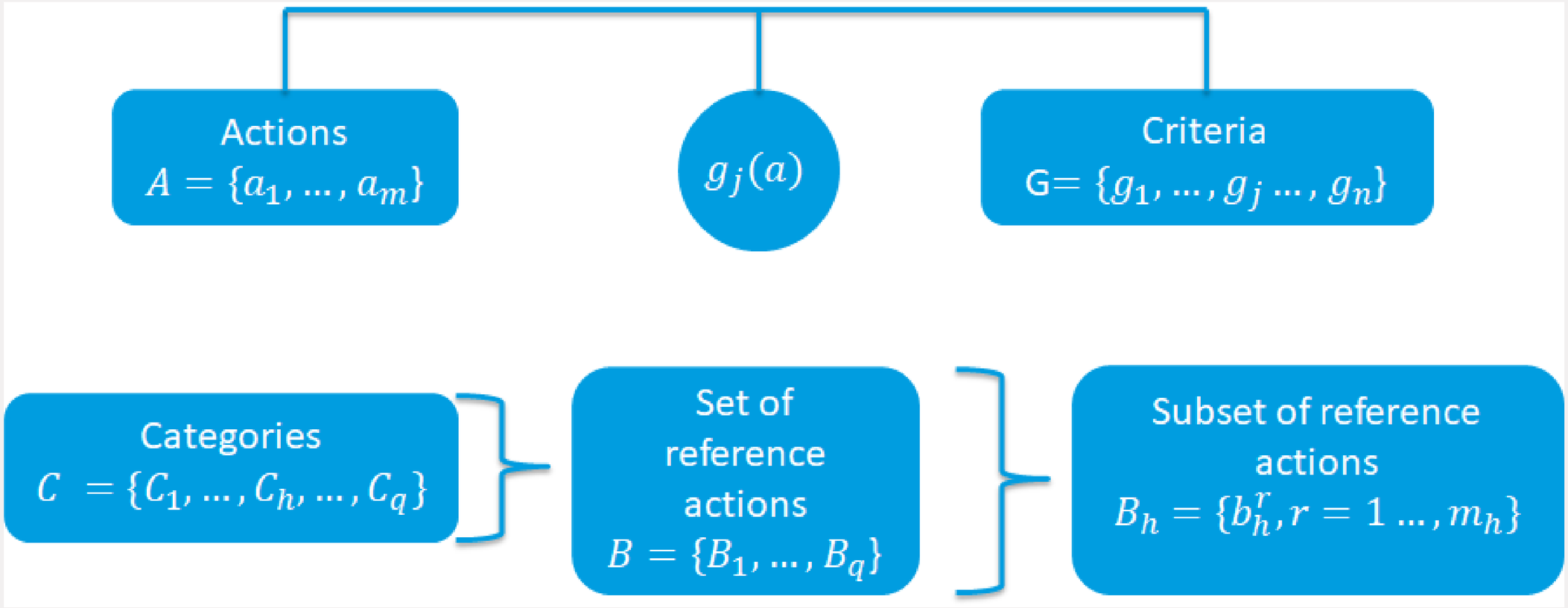


→ ELECTRE TRI-C assigments

↘ Conversion from categories to viewpoint in 2018

Hospital	Category		Viewpoint	
	Minimum	Maximum	Lower-level	Upper-level
a_2	C_3	C_4	3	4
a_3	C_1	C_2	1	2
a_4	C_4	C_4	4	4

ELECTRE TRI-NC DATA



PERFORMANCE TABLES

Performance tables for the years of 2017 and 2018 and respective viewpoints

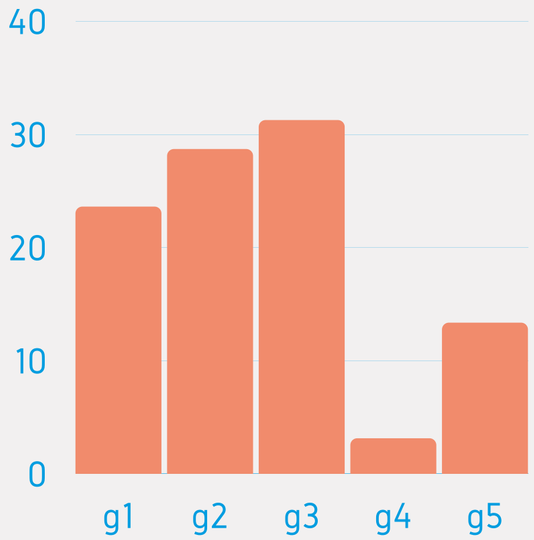
Hospital	2017										2018									
	Lower-level					Upper-level					Lower-level					Upper-level				
	g_1	g_2	g_3	g_4	g_5	g_1	g_2	g_3	g_4	g_5	g_1	g_2	g_3	g_4	g_5	g_1	g_2	g_3	g_4	g_5
a_1	2	3	4	2	2	3	4	4	2	3	3	3	4	3	2	3	4	4	4	3
a_2	4	3	5	1	3	5	4	5	1	3	4	3	5	2	3	5	4	5	2	3
a_3	2	2	3	3	3	2	2	3	3	4	3	1	4	3	3	3	2	4	3	3
a_4	2	3	5	4	2	2	3	5	4	2	2	4	5	3	2	2	4	5	3	2
a_5	3	3	4	2	4	3	4	4	2	4	3	4	3	3	3	3	4	4	3	3
...																				
a_{20}	3	2	2	4	3	3	3	2	4	4	2	3	2	4	3	2	3	2	4	3
a_{21}	2	2	3	4	3	2	2	3	4	3	2	3	4	4	3	2	3	4	4	3
a_{22}	3	2	3	3	3	3	3	3	3	3	3	3	2	3	3	3	4	2	3	3
a_{23}	3	2	2	3	3	3	3	2	5	3	2	4	3	4	3	3	4	3	4	4
a_{24}	2	3	3	3	3	2	3	3	5	3	3	5	3	5	3	3	5	3	5	3
a_{25}	2	2	3	4	3	3	2	3	4	3	2	2	2	3	3	3	2	2	4	4

PREFERENCE PARAMETERS

Set of reference hospitals per category

Category	Performance	Reference hospital	Criterion				
			g_1	g_2	g_3	g_4	g_5
C_5	Very Good	b_5^1	5	5	5	5	5
		b_5^2	5	4	5	4	5
		b_5^3	5	4	5	4	4
C_4	Good	b_4^1	4	4	5	4	5
		b_4^2	4	4	5	4	4
		b_4^3	4	4	4	4	4
C_3	Neutral	b_3^1	4	4	4	3	4
C_2	Poor	b_2^1	3	3	4	3	4
		b_2^2	3	3	3	3	3
C_1	Very Poor	b_1^1	3	2	3	2	3
		b_1^2	2	2	2	2	3
		b_1^3	2	2	2	1	3

Weights of the criteria



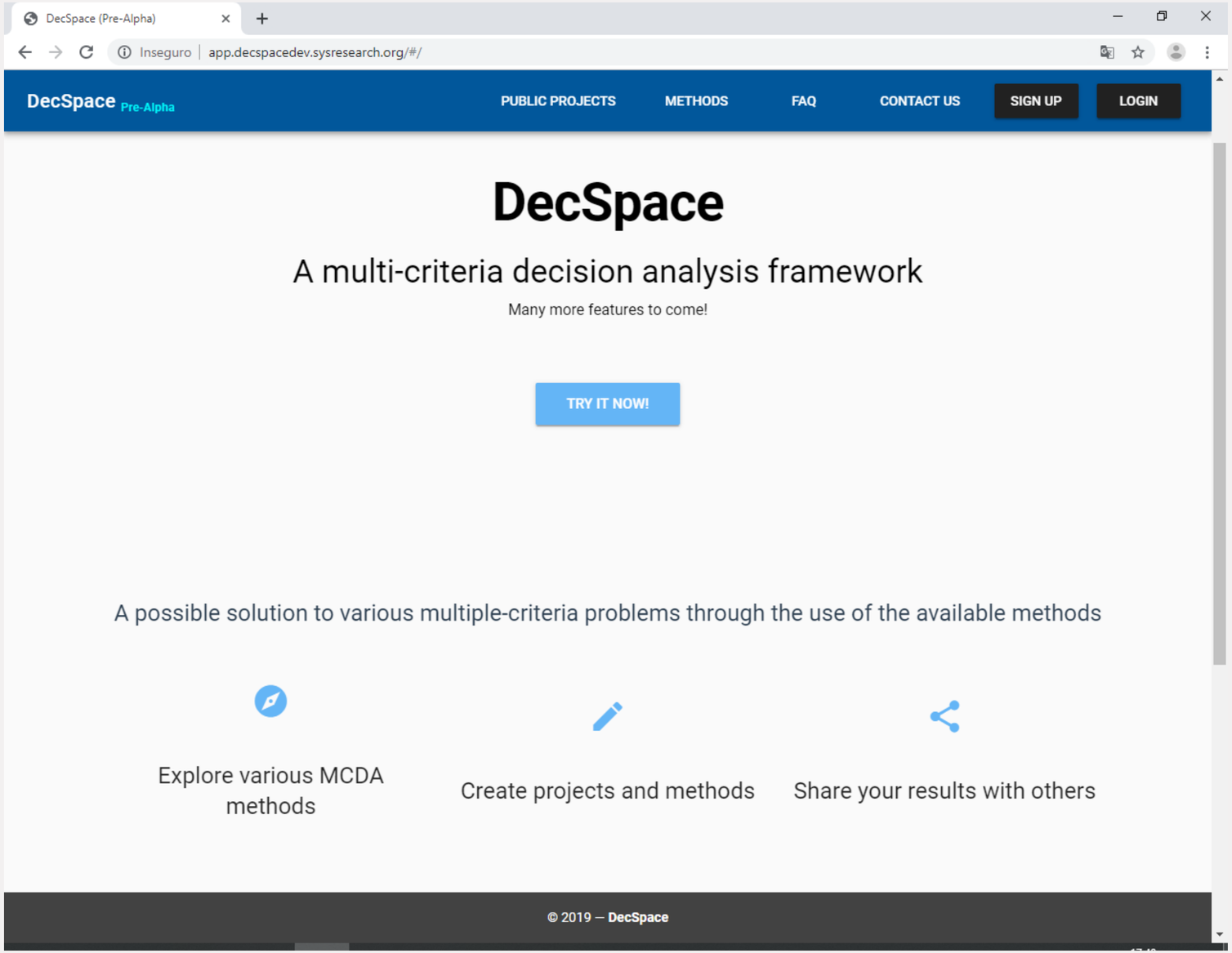
Veto thresholds

	g_1	g_2	g_3	g_4	g_5
v	$\emptyset$	2	3	$\emptyset$	$\emptyset$

~~Indifference and preference thresholds~~

Credibility level = 0,6

3. SOFTWARE, RESULTS AND DISCUSSION



DECSPACE

Homepage

It provides similar features to the ones of other MCDA solutions that already exist, but it offers those features together into a standalone web-based service available for anyone

USING DECSPACE

TEACHING

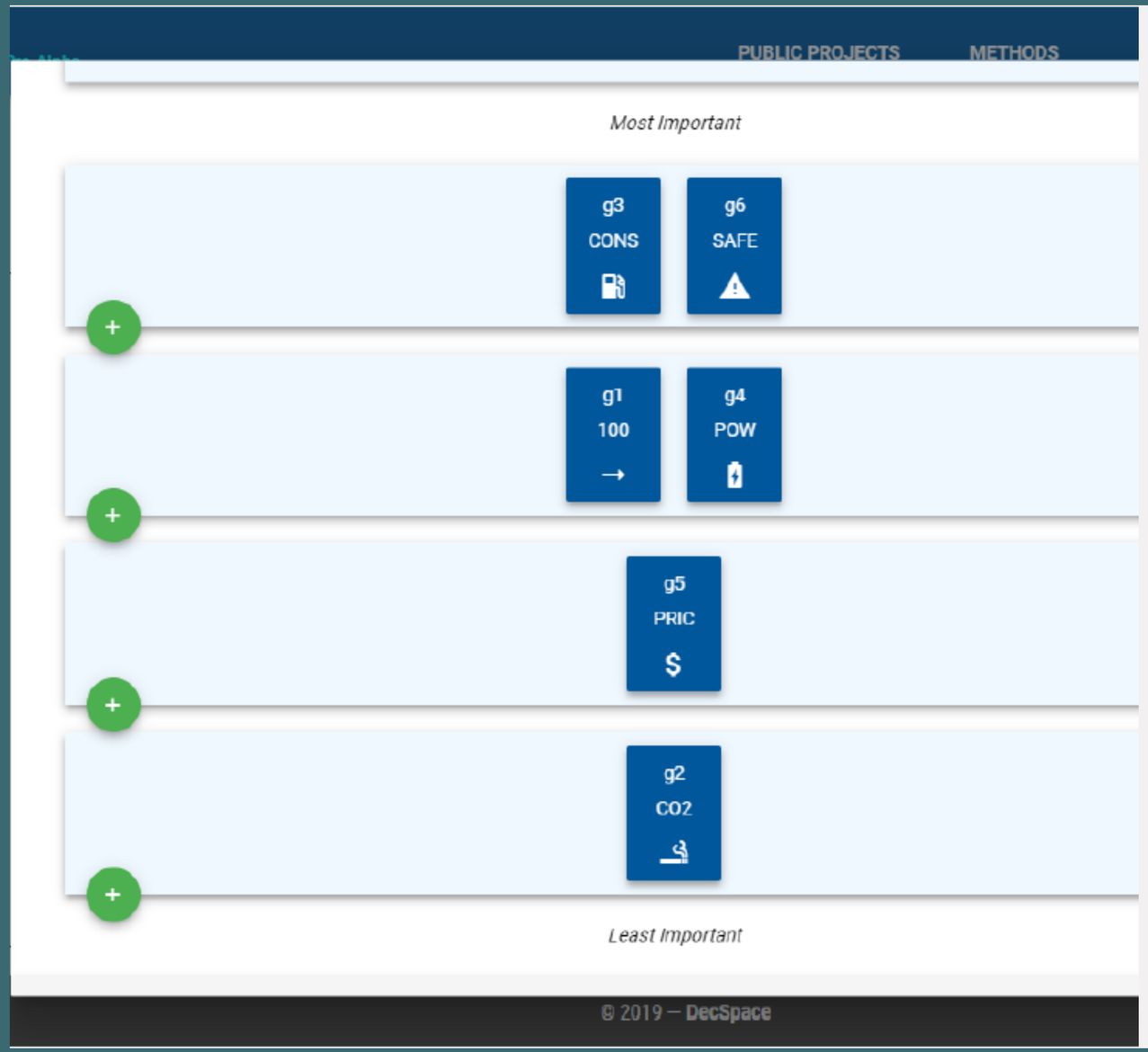
It can be used for teaching purposes related to MCDA and other areas

RESEARCH

It is very useful in research works for various areas of application

PROFESSIONAL

It is suitable for professional use in engineering and management

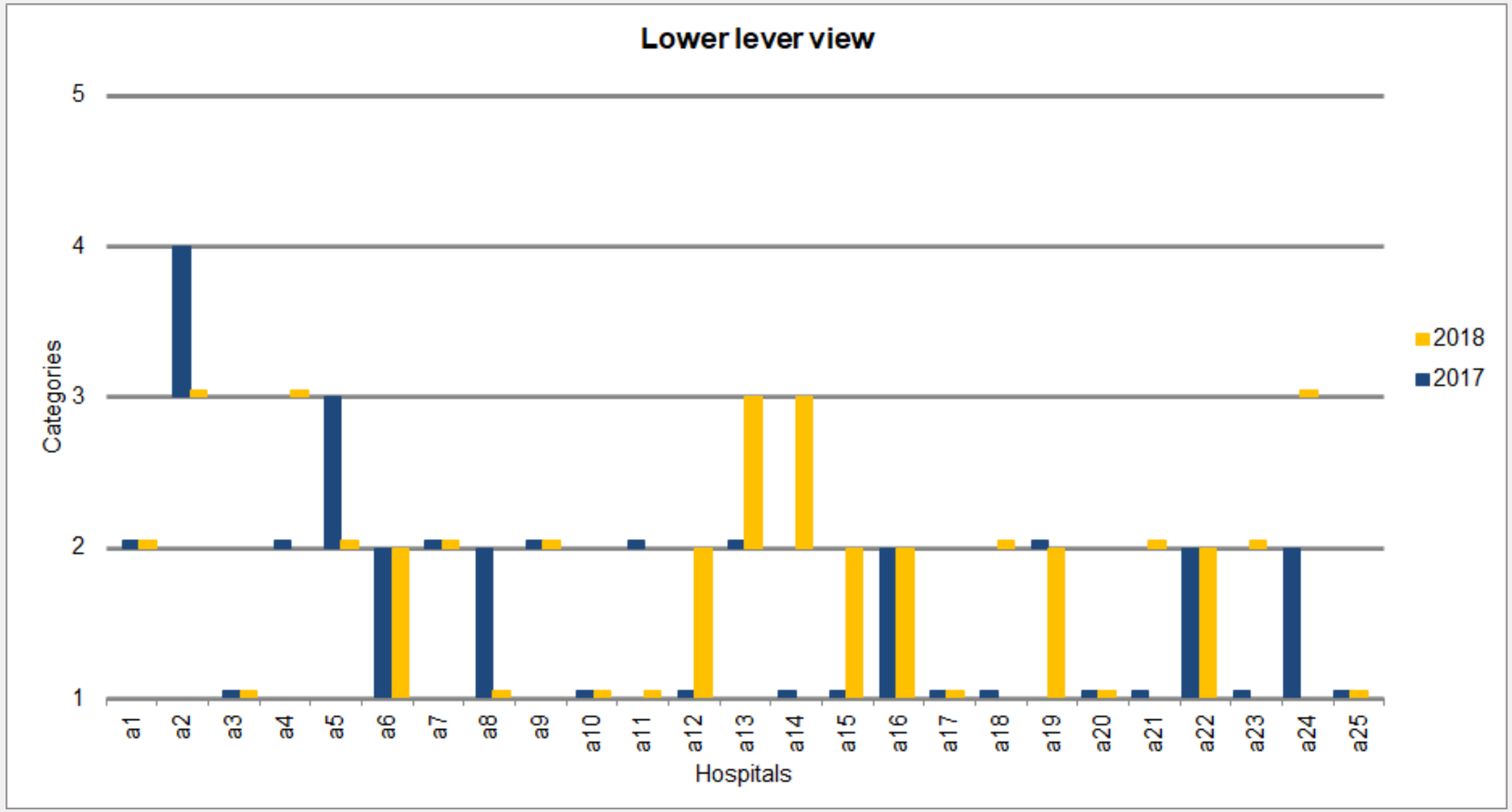


DCM-SRF

Deck of Cards Method - Simos-Roy-Figueira (DCM-SRF) permits to determine the weights of criteria mainly based on a cards ranking constructed by the DM using criteria cards and blank cards (+ ratio z) (Figueira & Roy, 2002)

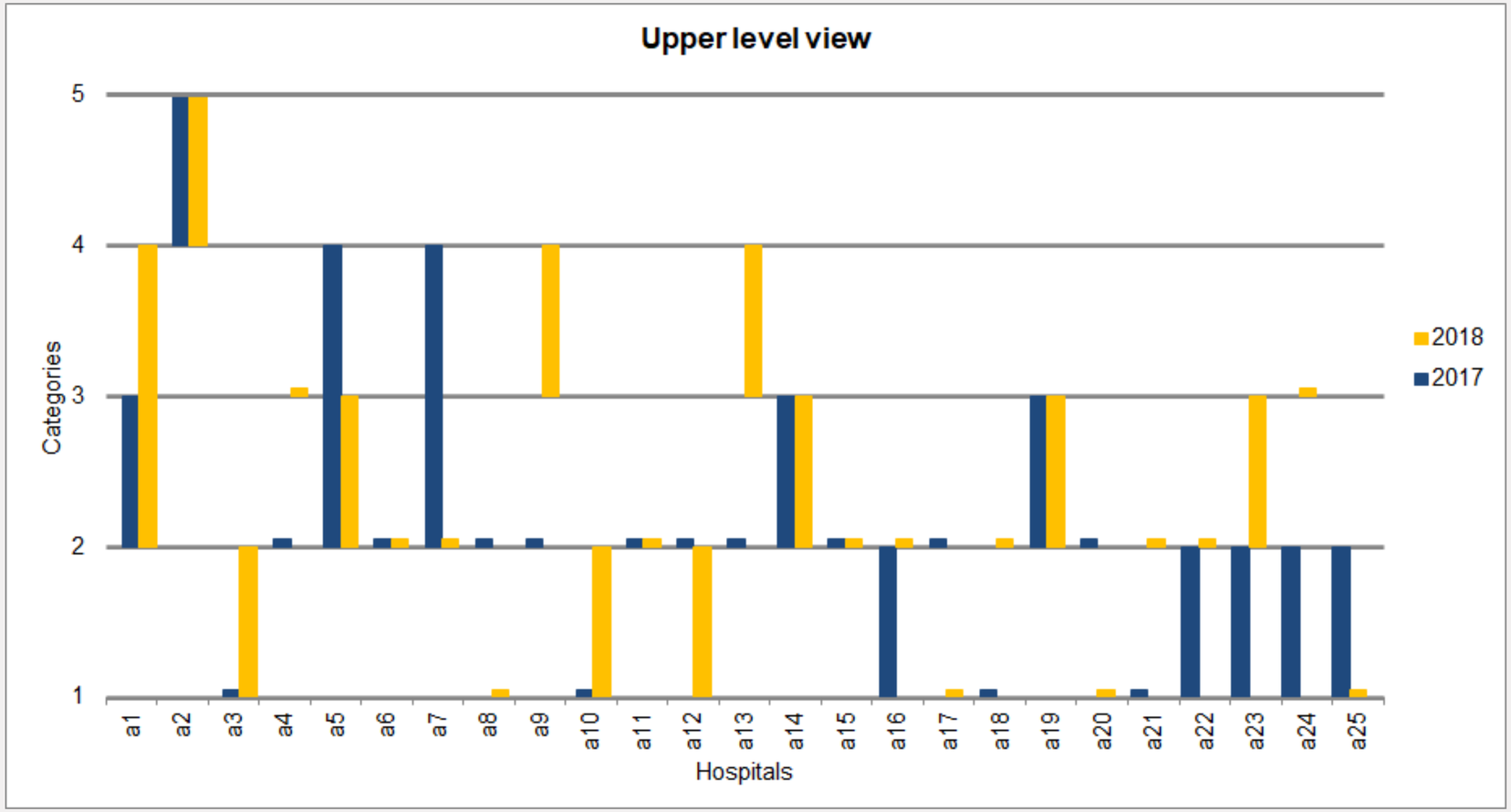
RESULTS - LOWER LEVEL VIEW

MCDA-ULaval v0.6
Multicriteria Decisions | Décisions Multi-Critères



RESULTS - UPPER LEVEL VIEW

MCDA-ULaval v0.6
Multicriteria Decisions | Décisions Multi-Critères

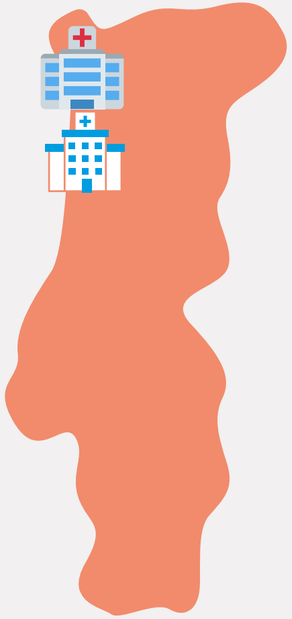


RESULTS OVERVIEW

Interval of category		2017		2018	
Min.	Max.	Lower-level view	Upper-level view	Lower-level view	Upper-level view
C_1	C_1	11 (44%)	4 (16%)	7 (28%)	4 (16%)
C_1	C_2	5 (20%)	5 (20%)	6 (24%)	3 (12%)
C_2	C_2	7 (28%)	10 (40%)	7 (28%)	8 (32%)
C_2	C_3	1 (4%)	3 (12%)	2 (8%)	4 (16%)
C_2	C_4	0 (0%)	2 (8%)	0 (0%)	1 (4%)
C_3	C_3	0 (0%)	0 (0%)	3 (12%)	2 (8%)
C_3	C_4	1 (4%)	0 (0%)	0 (0%)	2 (8%)
C_4	C_4	0 (0%)	0 (0%)	0 (0%)	0 (0%)
C_4	C_5	0 (0%)	1 (4%)	0 (0%)	1 (4%)
C_5	C_5	0 (0%)	0 (0%)	0 (0%)	0 (0%)

DISCUSSION

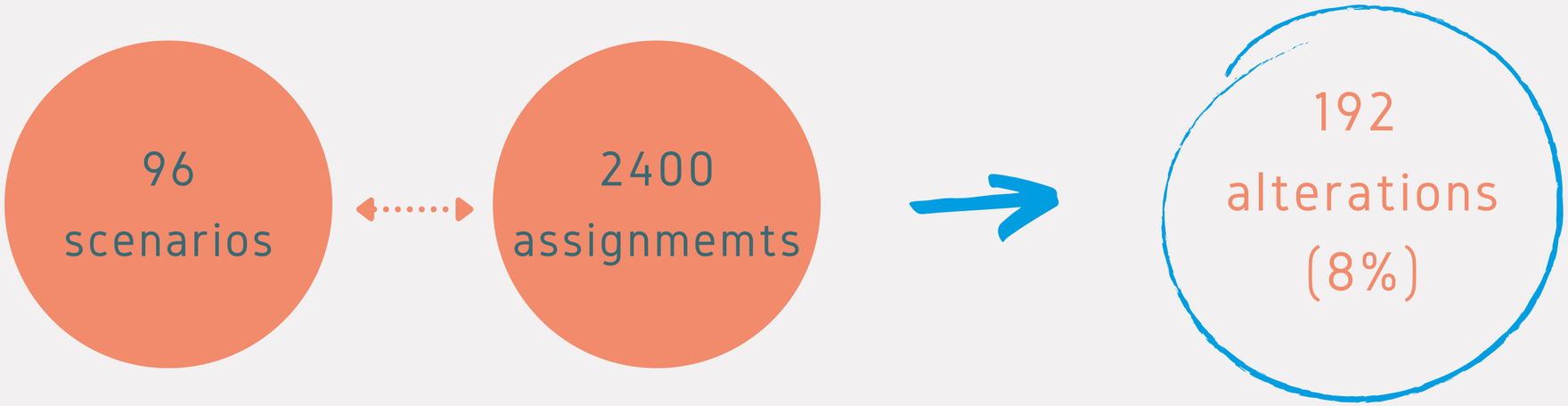
- Assignments in 2018 tend to be better than in 2017
- In general, there are better assignments in the upper-level view
- There was no assignments to $C5$
- The majority of hospitals were assigned to C1 and C2
- $a2$ - Centro Hospitalar Póvoa de Varzim/Vila do Conde is always the best
- $a24$ - Centro Hospitalar Universitário do Porto improved from 2017 to 2018



ROBUSTNESS ANALYSIS

SCENARIO ANALYSIS

1. Changing the credibility level
2. Changing the weights
3. Changing both the credibility level and weights



4. FINAL REMARKS

FINAL REMARKS

OUTCOMES

Assignment of the Portuguese Public Hospitals to predefined categories ordered by overall quality level

CONTRIBUTIONS

A robust decision model for assessing hospitals' quality using a novel approach for consctructing criteria' scales

IMPLICATIONS

Potential application to healthcare policy and hospital funding in the SNS

FUTURE WORK

Considering other information in model (e.g., about the infrastructures)

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THANK YOU!

Obrigada!!!

QUESTIONS & COMMENTS

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