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How to obtain a ranking of individuals measuring their excellence by means of a Multicriteria Decision Model

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Table of Contents

- Introduction
- Problem: « The election by the students of the Final Degree Project”
- The best tools to deal with the problem: PROMETHEE and VISUAL PROMETHEE
- Decision Model: How To Obtain A Ranking Of Individuals
- Final Results

Introduction

- A common problem in many areas, both public and private is ranking a group of individuals evaluated under different criteria which aim to measure their excellence.

- We present a model belonging to the educational field, which establishes a ranking among students in the final year of Degree studies for the purpose of the election of their Final Degree Project (FDP).

Introduction

- The ranking obtained can be a partial or a total pre-order.

- These orders reflect the excellence of each student through a series of criteria, both qualitative and quantitative, taking into account the relevance that every criterion has for the academic authorities (Dean of the Faculty, Academic Secretary, etc.).

- We consider that PROMETHEE Methods are appropriate to manage this sort of decision problem. The study is enriched with the software Visual PROMETHEE, a new tool that has been designed to help the decision–maker in the decision process.

Introduction

- In this way a logic solution is obtained, devoid of inconsistences and that can be firmly justified and therefore accepted by the academic authorities and by students who do not wish to be affected by arbitrary or changes in the rules.

Problem: « The election by the students of the Final Degree Project"

- The decision problem that we face is the following:

- *When students of Degree at the School of Business and Economics from the Universidad CEU San Pablo come to the last course must carry out a thesis or final degree project (FDP).*
- *This work has as many credits as a main-compulsory subject and the process of development of it should begin when the academic year starts.*
- *The election by the students of the FDP is usually carried out in the month of September or October, among those offered by the Faculty.*

Problem: « The election by the students of the Final Degree Project"

- Until the academic year, 2012-2013, the criterion for establishing the order of election of the students was to give priority to those students who had better academic record.

- Given that the number of jobs that are offered by each Area of knowledge has a quota, those students have a privileged position with respect to their schoolmates.

- Many quantitative analyses were taking into account and the conclusion was that the allocation system resulted in inconsistencies and sometimes became unfair.

Problem: « The election by the students of the Final Degree Project"

- It is clear that we are facing a problem of Multicriteria Decision and we have to proceed to the solution of it, bearing in mind that it is not determined only by the basic information contained in the decision matrix, but that also depends on the decision-maker.

The best tools to deal with the problem: PROMETHEE and VISUAL PROMETHEE

- PROMETHEE Methods have a large tradition in the field of Multicriteria Decision Aid and Visual PROMETHEE is the software that has been designed to help the decision-maker in the decision process. It is the most recent, complete and update tool to implement PROMETHEE Methods and GAIA Technique.

- Since the objective of our work is not to make a detailed description of the methodology but use it as a reference tool for decision support models, next, we will describe the decision model at hand.

Decision Model: HOW TO OBTAIN A RANKING OF INDIVIDUALS

- The decision problem that we need to solve is to obtain a ranking of excellence among students of last degree course for the purposes of the choice of the FDP.

- This pilot study will be applied to only one of the degrees that are offered at the School of Business and Economics from the Universidad CEU San Pablo and consists of two groups of students.

- Our alternatives are, logically, students who make up the two groups of the degree. For reasons of data protection and privacy, we will not indicate the names of the students but will call them as: op_1, op_2, etc. (referring to the number of options or alternatives).

Decision Model: HOW TO OBTAIN A RANKING OF INDIVIDUALS

- We have concrete data from each student, i.e., which will be reflected on quantitative criteria and qualitative data that were provided by the Dean (captured using various techniques).

- The problem consists of six criteria. The elaborated model is flexible enough to incorporate other assessment judgments, to discriminate more, and therefore get more reliable decisions.

- The criteria considered in the problem are: academic record, specific activities, Business Program, copy in exams, written warnings, delegate/sub-delegate (representative function).

Decision Model: HOW TO OBTAIN A RANKING OF INDIVIDUALS

- The vector of weights was given by the Dean: academic record receives a 90% of importance and the remaining 10% is divided proportionally among the other criteria.

Description of the criteria:

❖ **Academic Record**: reflects only the average mark obtained by the student (Criterion 1).

❖ **Delegate / Sub-delegate (representative functions):**

Delegates and sub delegates are elected by vote in each group of students and they have representative functions. They must represent their peers both to the academic authorities as to the faculty or staff (Criterion 2).

Decision Model: HOW TO OBTAIN A RANKING OF INDIVIDUALS

- **Copy in exams:** Reflects the penalties that could be a student for cheating on tests. A qualitative five-point scale is considered taking into account the seriousness of the offense and its reoccurrence (Criterion 3).

- **Written Warnings :** in case of bad behavior, mobile phone use, violation of the norms of conduct in general terms. A qualitative scale comprising five levels is considered (Criterion 4) .

Decision Model: HOW TO OBTAIN A RANKING OF INDIVIDUALS

- **Business Program** (Criterion 5)

- The "Program of Economic and Business News " was launched by the Faculty of Economics and Business during the academic year 2013-14 .

- Its aim is to bring students to prominent speakers from various professional fields and share their experiences in a relaxed atmosphere.

- It is a new participatory format interview, conducted by two students and moderated by a teacher and debate with the audience. It is open to all students and takes place every Thursday at 12:30 h .

Decision Model: HOW TO OBTAIN A RANKING OF INDIVIDUALS

- **Specific Activities:** includes student participation in activities such as volunteering (do work for charity) , Aula Innova (Multiple purpose classroom, innovation area), , Promotion Programs (to publicize de University) , StartinCEU program; etc. (Criterion 6).

Decision Model: HOW TO OBTAIN A RANKING OF INDIVIDUALS

StartinCEU:

- STARTinCEU is an initiative of the students of the Faculty of Economics and Business, University CEU San Pablo that seeks to promote entrepreneurship and enterprise development in students.

- A meeting point for all students , faculty and alumni who share the enthusiasm and concern undertaken, starting their own business , or even improve their professional development through all the opportunities , bringing the reality of business students thanks to companies working in the project.

- Comprising of 4 programs that respond to the needs of students in further education , entrepreneurship , business development and university campus life .

- attitude in students and encourage business development for the university.

Decision Model: HOW TO OBTAIN A RANKING OF INDIVIDUALS

StartinCEU:

- The aim of STARTinCEU summarized in three words :

- CREATE: Internal Projects by students and teachers for college, or external building projects entrepreneurship, innovation , outsourcing to companies , etc.
- UNITE : Being a link between the 3 pillars of human capital that should be our university : students, professors and alumni, together with the companies involved in this project.
- DEVELOPING : proactive and entrepreneurial

Decision Model: HOW TO OBTAIN A RANKING OF INDIVIDUALS

Aula Innova:

An original space at the Faculty of Economics and Business Administration from the University CEU San Pablo and the first in a Spanish University designed to encourage teamwork , proactivity , the relationship between students, the implementation of projects ...

Designed under the design features and philosophy of the AULA current company Innova features:

Spaces for Workgroups .

Brainstorming spaces .

Spaces for workshops and seminars.

Area lectures and presentations .

Relaxation area, vending space , etc.

Decision Model: HOW TO OBTAIN A RANKING OF INDIVIDUALS

It also has a schedule of free access for students to develop their projects , interact with each other and foster personal and professional relationships.

In addition STARTinCEU partner companies can have their infrastructure to perform activities of interest to students of the university , product / services , etc.

Decision Model: HOW TO OBTAIN A RANKING OF INDIVIDUALS

- **Classroom Volunteer** aims to promote , channel and coordinate social volunteer tasks with the assistance of members of the educational community ultimately aims to help people in need, people in poverty and / or social marginalization.

- In his performance , makes himself one of the purposes set out in the Statutes of the University Foundation San Pablo- CEU : building a more just and fraternal society through the common good .

- The men and women that forms in the Schools of CEU requires a social formation in which you would cooperate and participate in the work and community projects ; to show solidarity and to engage in social problems; training them in liberty and freedom ; on dialogue and tolerance .

Analysis of results: PROMETHEE-GAIA

PROMETHEE Flows

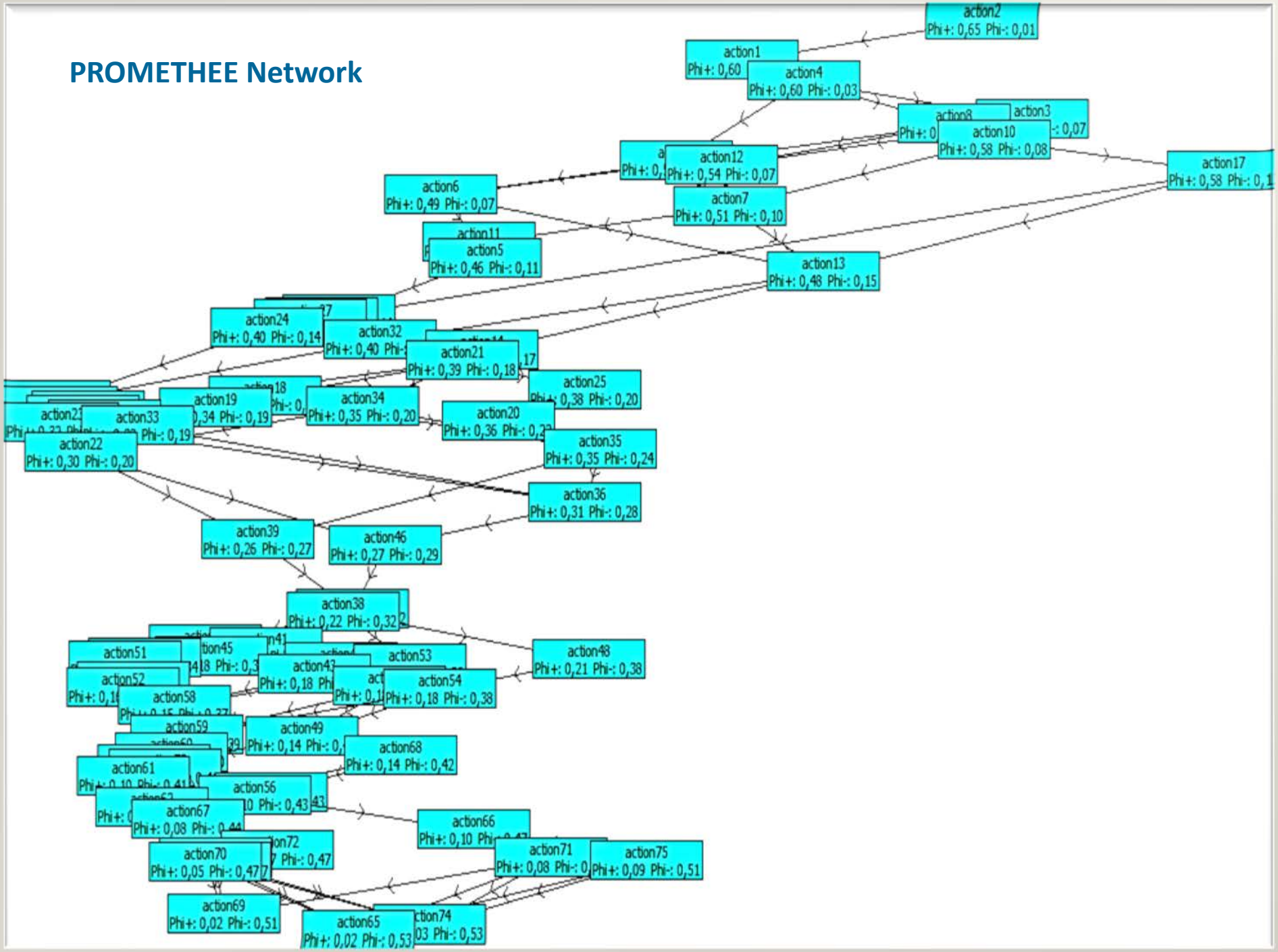
Rank	action	Phi	Phi+	Phi-
1	action2	0,6450	0,6501	0,0051
2	action1	0,5948	0,6048	0,0100
3	action4	0,5686	0,5969	0,0283
4	action3	0,5199	0,5918	0,0719
5	action8	0,5143	0,5824	0,0681
6	action10	0,4938	0,5756	0,0818
7	action9	0,4681	0,5359	0,0678
8	action12	0,4626	0,5369	0,0743
9	action17	0,4550	0,5755	0,1205
10	action6	0,4236	0,4938	0,0702
11	action7	0,4090	0,5108	0,1018
12	action11	0,3644	0,4674	0,1030
13	action5	0,3441	0,4578	0,1137
14	action13	0,3280	0,4783	0,1503
15	action15	0,2735	0,4102	0,1366
16	action16	0,2694	0,4066	0,1372
17	action27	0,2672	0,4046	0,1374
18	action24	0,2560	0,3953	0,1393
19	action32	0,2403	0,3970	0,1567
20	action14	0,2284	0,3996	0,1713
21	action21	0,2155	0,3916	0,1761
22	action25	0,1783	0,3833	0,2050
23	action18	0,1702	0,3522	0,1820
24	action26	0,1653	0,3320	0,1667
25	action34	0,1580	0,3543	0,1964
26	action28	0,1577	0,3288	0,1711
27	action19	0,1559	0,3410	0,1851
28	action29	0,1515	0,3280	0,1765
29	action30	0,1464	0,3249	0,1785
30	action31	0,1398	0,3235	0,1837
31	action20	0,1386	0,3561	0,2175
32	action23	0,1365	0,3183	0,1818
33	action33	0,1329	0,3229	0,1900
34	action35	0,1026	0,3467	0,2441
35	action22	0,0997	0,3014	0,2018
36	action36	0,0347	0,3114	0,2767
37	action39	-0,0104	0,2613	0,2718
38	action46	-0,0182	0,2681	0,2864
39	action37	-0,0998	0,2246	0,3244
40	action38	-0,1019	0,2228	0,3247
41	action44	-0,1436	0,1903	0,3339
42	action41	-0,1478	0,1934	0,3411
43	action45	-0,1584	0,1834	0,3418
44	action47	-0,1612	0,1763	0,3375
45	action48	-0,1633	0,2128	0,3761
46	action51	-0,1650	0,1728	0,3378
47	action40	-0,1663	0,1904	0,3567
48	action53	-0,1675	0,1956	0,3631
49	action43	-0,1822	0,1802	0,3624
50	action50	-0,1900	0,1610	0,3510
51	action42	-0,1964	0,1794	0,3759
52	action52	-0,1974	0,1564	0,3538
53	action54	-0,1992	0,1823	0,3815
54	action58	-0,2201	0,1494	0,3695

Analysis of results: PROMETHEE-GAIA

PROMETHEE Flows

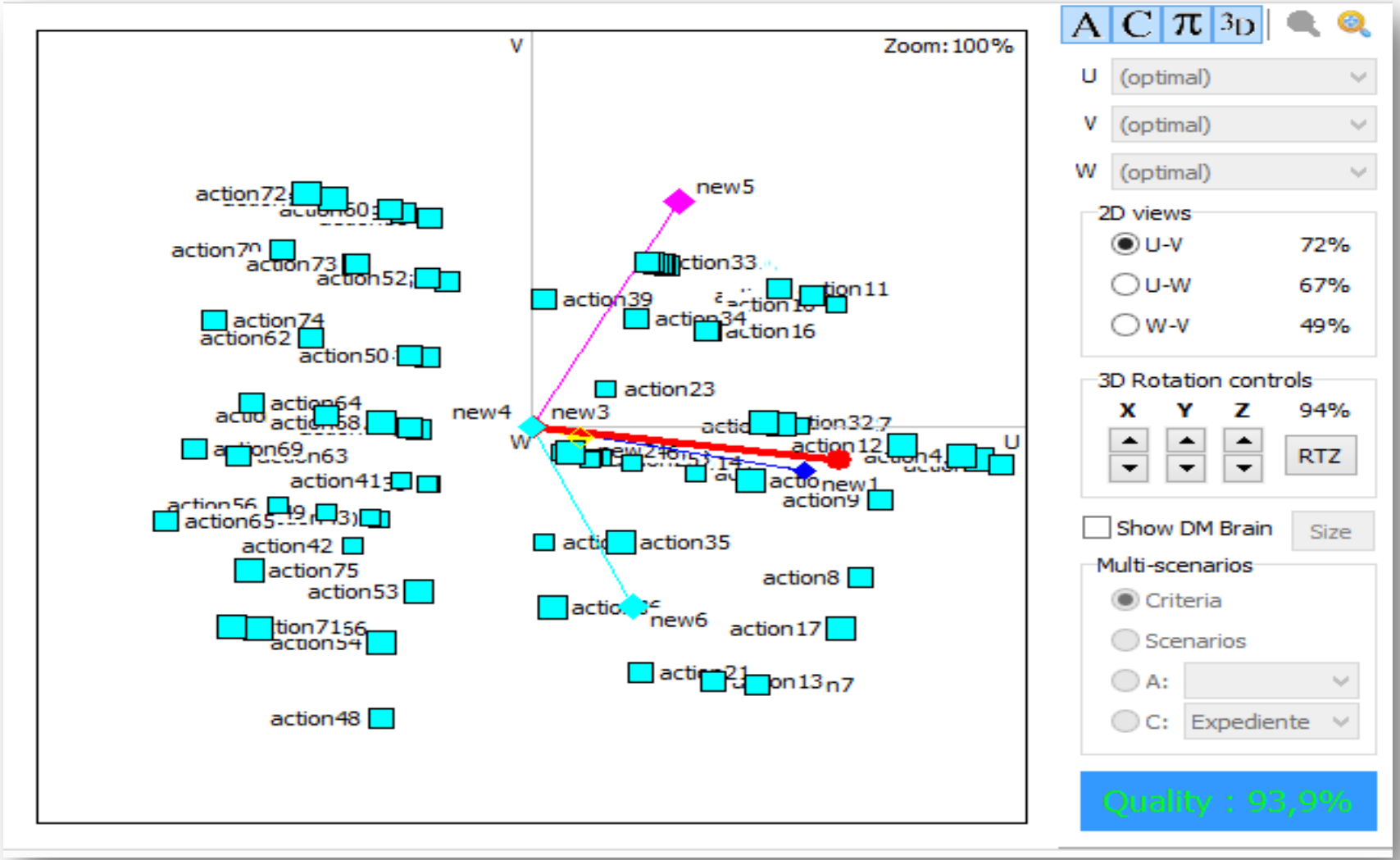
55	action59		-0,2589	0,1311	0,3900
56	action49		-0,2600	0,1402	0,4002
57	action60		-0,2796	0,1195	0,3990
58	action68		-0,2850	0,1361	0,4210
59	action57		-0,2957	0,1099	0,4057
60	action73		-0,3006	0,1084	0,4090
61	action61		-0,3098	0,1012	0,4109
62	action55		-0,3309	0,1022	0,4331
63	action56		-0,3348	0,0989	0,4337
64	action62		-0,3490	0,0831	0,4321
65	action67		-0,3653	0,0780	0,4433
66	action66		-0,3774	0,0961	0,4734
67	action72		-0,4045	0,0660	0,4705
68	action63		-0,4137	0,0561	0,4698
69	action71		-0,4140	0,0843	0,4983
70	action75		-0,4172	0,0908	0,5079
71	action64		-0,4184	0,0537	0,4721
72	action70		-0,4187	0,0528	0,4715
73	action69		-0,4850	0,0212	0,5062
74	action74		-0,4977	0,0322	0,5299
75	action65		-0,5048	0,0227	0,5274

PROMETHEE Network



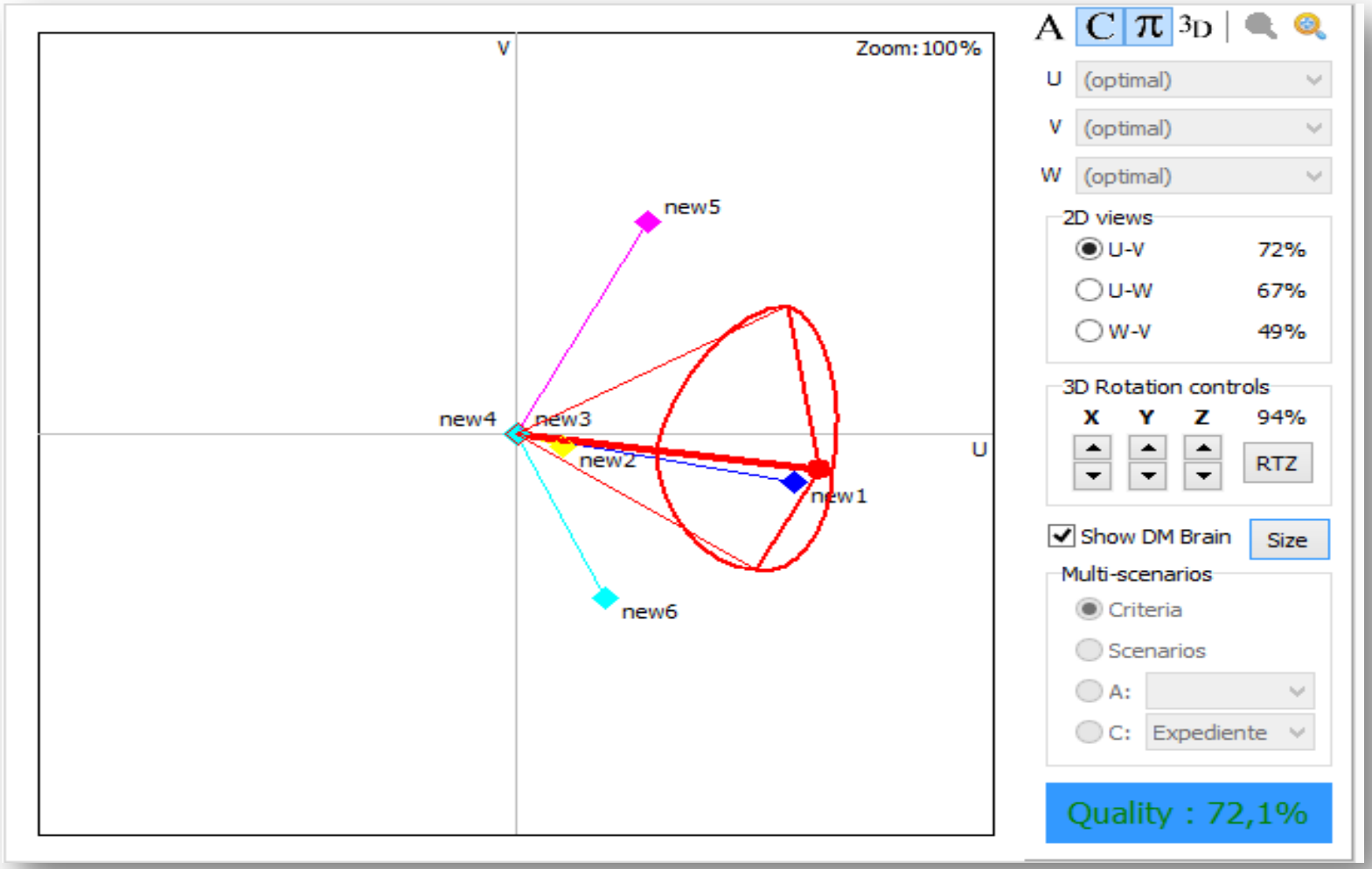
Analysis of results: PROMETHEE-GAIA

GAIA –Visual Analysis



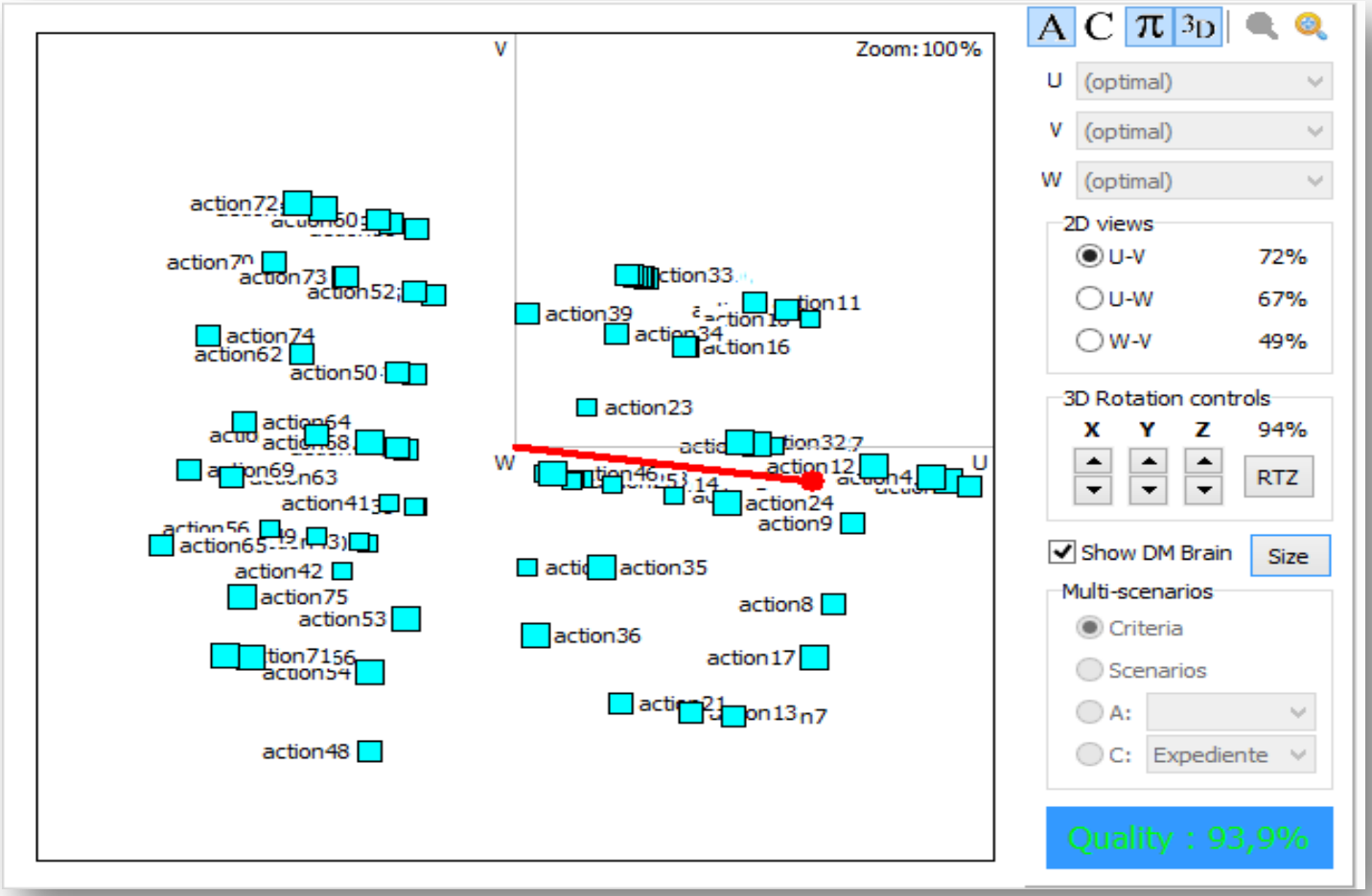
Analysis of results: PROMETHEE-GAIA

GAIA –Visual Analysis



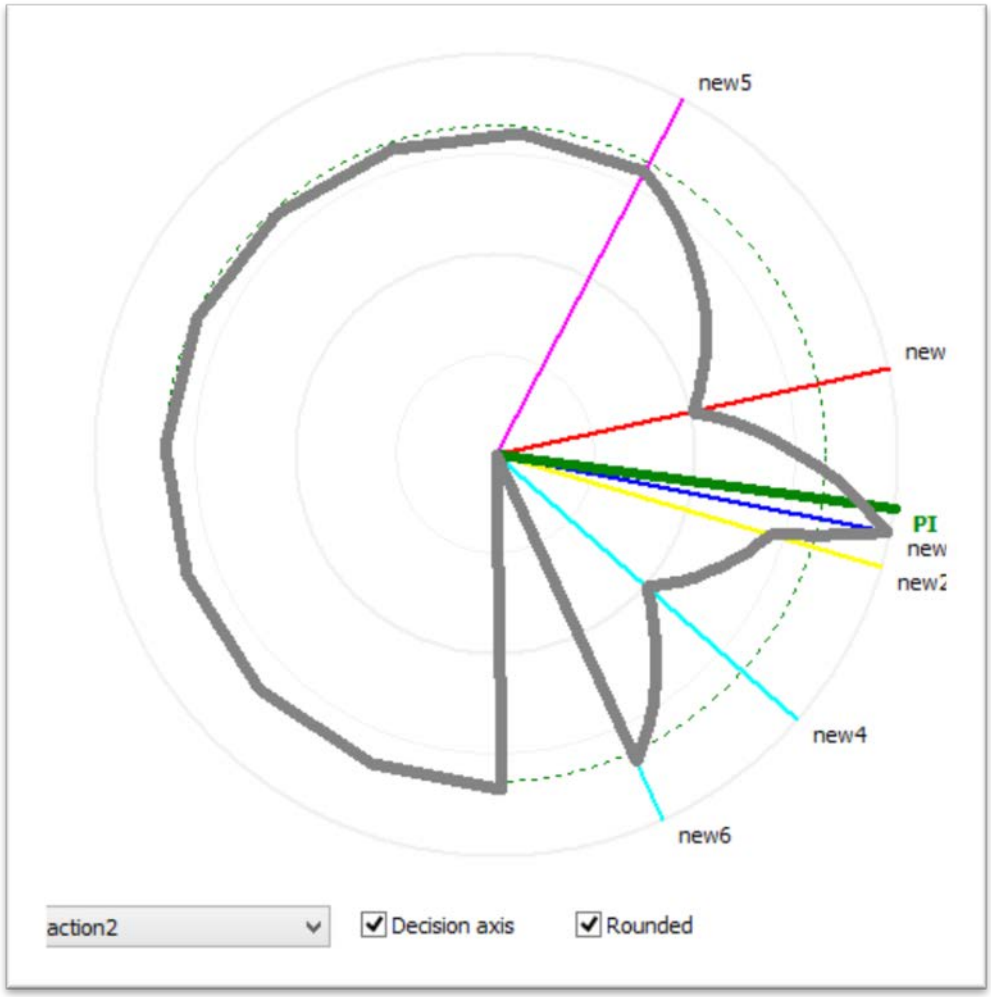
Analysis of results: PROMETHEE-GAIA

GAIA –Visual Analysis



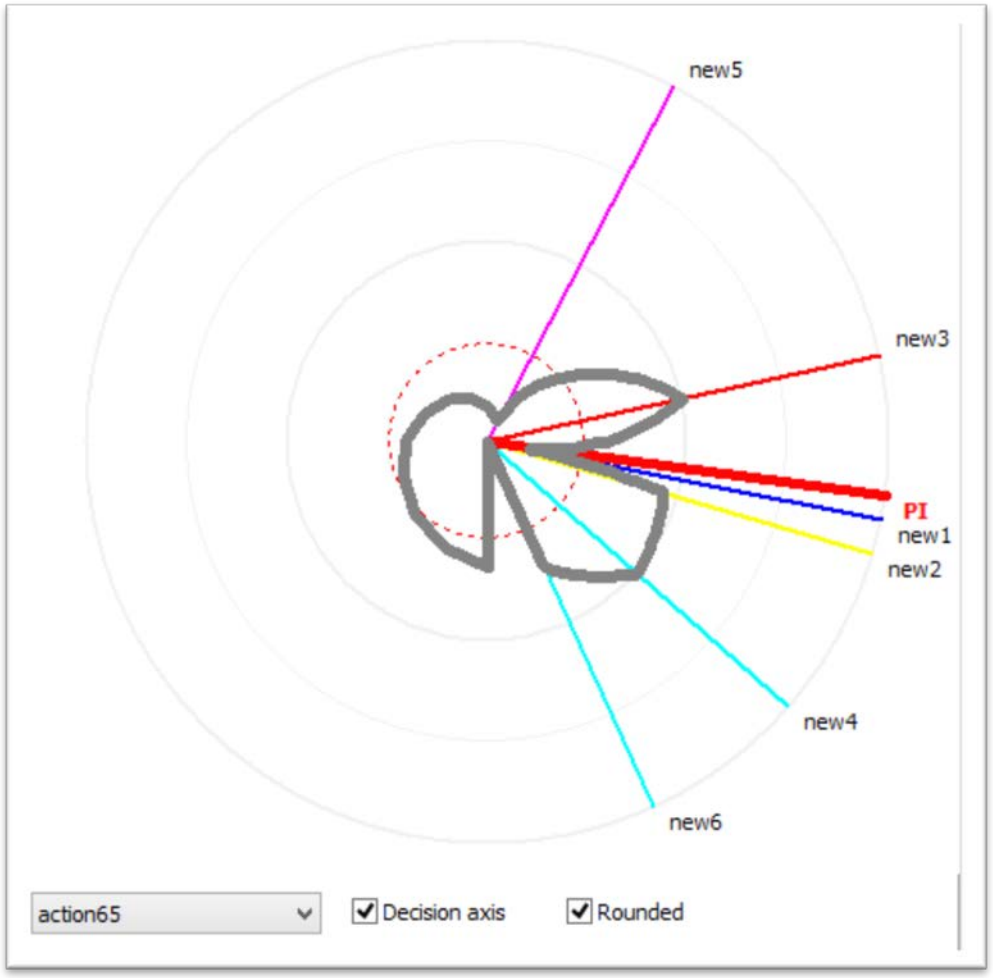
Analysis of results: PROMETHEE-GAIA

GAIA Web: The best alternative



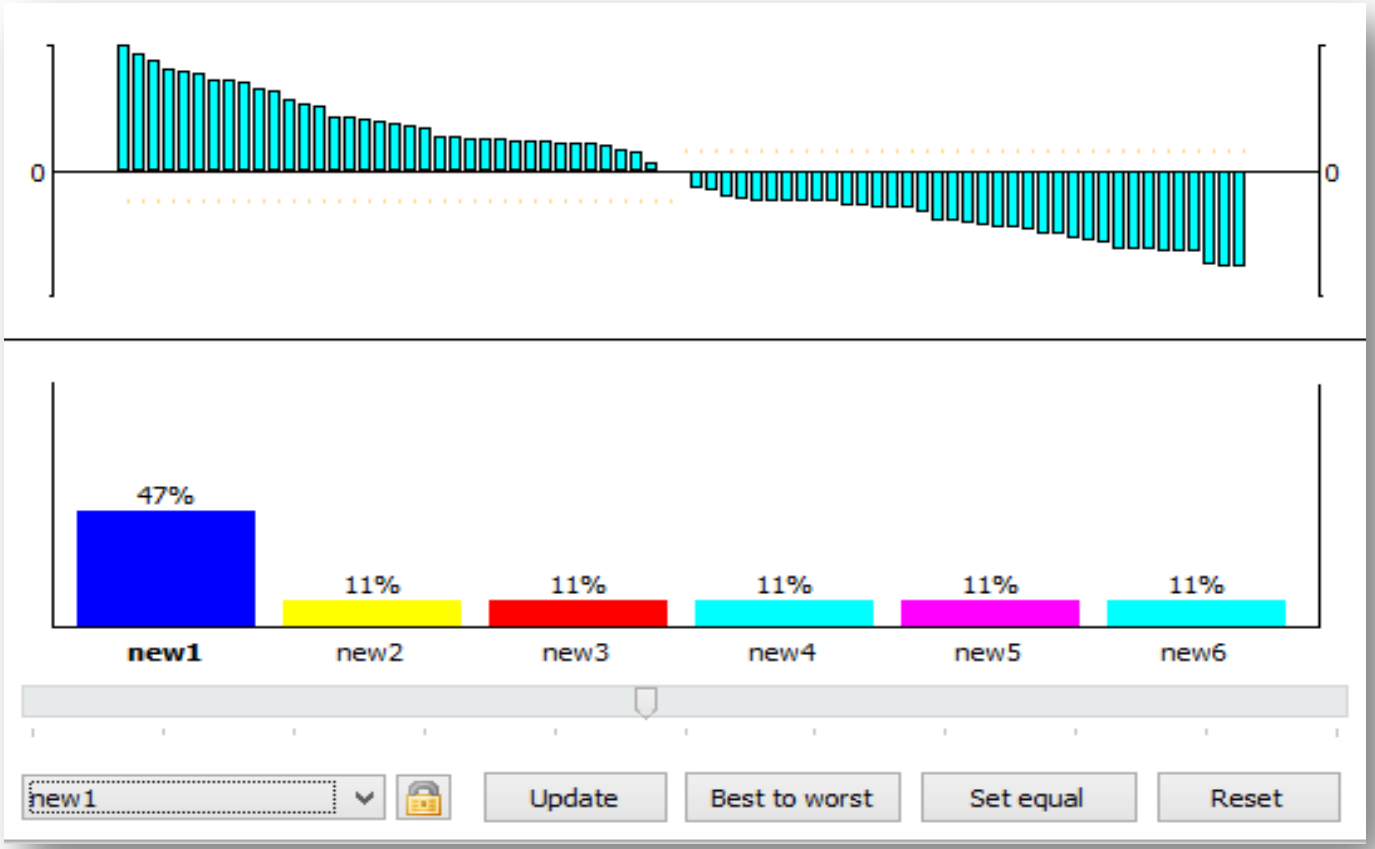
Analysis of results: PROMETHEE-GAIA

GAIA Web: The worst alternative



Analysis of results: PROMETHEE-GAIA

The Walking Weights



Analysis of results: PROMETHEE-GAIA

Unicriterion Preference Flows

	Academic	Delegate/Su	Copying in	Behaviour/W	Business	Specific
action1	0,9882	-0,0811	0,0000	0,0000	0,5958	0,6892
action2	0,9816	0,4257	0,0000	0,0000	0,5958	0,6892
action3	0,9473	0,9324	0,0000	0,0270	0,0276	-0,3108
action4	0,9208	-0,0811	0,0541	0,0000	0,5958	0,6892
action5	0,8789	-0,0811	0,0000	0,0000	-0,2942	-0,3108
action6	0,8490	-0,0811	0,0000	0,0000	0,5958	-0,3108
action7	0,8480	-0,0811	0,0000	0,0000	-0,5387	0,6892
action8	0,8198	0,4257	0,0541	0,0000	0,0276	0,6892
action9	0,7734	-0,0811	0,0000	0,0000	0,3587	0,6892
action10	0,7719	0,9324	0,0000	0,0000	0,5958	-0,3108
action11	0,7179	-0,0811	0,0000	0,0270	0,5958	-0,3108
action12	0,7092	-0,0811	0,0000	0,0000	0,5958	0,6892
action13	0,6860	-0,0811	-0,0405	0,0000	-0,5387	0,6892
action14	0,6346	-0,0811	0,0000	0,0000	-0,2942	-0,3108
action15	0,5848	-0,0811	0,0000	0,0000	0,3587	-0,3108
action16	0,5762	-0,0811	0,0000	0,0000	0,3587	-0,3108
action17	0,5249	0,9324	0,0000	0,0000	0,0276	1,0000
action18	0,5118	-0,0811	0,0000	0,0000	-0,2942	-0,3108
action19	0,4816	-0,0811	0,0000	0,0000	-0,2942	-0,3108
action20	0,4309	0,4257	0,0000	0,0000	-0,7377	-0,3108
action21	0,4275	-0,0811	0,0541	0,0000	-0,5387	0,6892
action22	0,3629	-0,0811	0,0000	0,0000	-0,2942	-0,3108
action23	0,3692	-0,0811	0,0000	0,0000	0,0276	-0,3108
action24	0,3256	-0,0811	0,0000	0,0000	0,3587	0,6892
action25	0,3037	0,9324	0,0000	0,0000	-0,2942	-0,3108

Analysis of results: PROMETHEE-GAIA

Unicriterion Preference Flows

action26	0,3037	-0,0811	0,0000	0,0000	0,5958	-0,3108
action27	0,2966	-0,0811	0,0000	0,0000	0,5958	0,6892
action28	0,2876	-0,0811	0,0000	0,0000	0,5958	-0,3108
action29	0,2835	-0,0811	0,0000	-0,0405	0,5958	-0,3108
action30	0,2637	-0,0811	0,0000	0,0000	0,5958	-0,3108
action31	0,2499	-0,0811	0,0000	0,0000	0,5958	-0,3108
action32	0,2397	-0,0811	0,0000	0,0000	0,5958	0,6892
action33	0,2352	-0,0811	0,0000	0,0000	0,5958	-0,3108
action34	0,2282	0,4257	0,0000	0,0000	0,3587	-0,3108
action35	0,0754	-0,0811	0,0000	0,0000	0,0276	0,6892
action36	0,0035	-0,0811	0,0000	0,0000	-0,2942	0,6892
action37	-0,0039	-0,0811	0,0000	0,0000	-0,5387	-0,3108
action38	-0,0083	-0,0811	0,0000	0,0000	-0,5387	-0,3108
action39	-0,0147	-0,0811	0,0000	0,0000	0,3587	-0,3108
action40	-0,1001	-0,0811	0,0000	0,0000	-0,7377	-0,3108
action41	-0,1051	-0,0811	0,0000	0,0000	-0,5387	-0,3108
action42	-0,1312	-0,0811	0,0000	0,0000	-0,8839	-0,3108
action43	-0,1336	-0,0811	0,0000	0,0000	-0,7377	-0,3108
action44	-0,1507	-0,0811	0,0000	0,0000	-0,2942	-0,3108
action45	-0,1819	-0,0811	0,0000	0,0000	-0,2942	-0,3108
action46	-0,2534	-0,0811	0,0000	0,0000	0,3587	0,6892
action47	-0,2594	-0,0811	0,0000	0,0000	0,0276	-0,3108
action48	-0,2835	-0,0811	0,0000	0,0000	-0,8839	0,6892
action49	-0,2889	-0,0811	-0,0405	0,0000	-0,7377	-0,3108
action50	-0,3201	-0,0811	0,0000	0,0000	0,0276	-0,3108

Analysis of results: PROMETHEE-GAIA

Unicriterion Preference Flows

action51	-0,3411	-0,0811	0,0000	0,0000	0,3587	-0,3108
action52	-0,4094	-0,0811	0,0000	0,0000	0,3587	-0,3108
action53	-0,4234	-0,0811	0,0000	0,0000	-0,2942	0,6892
action54	-0,4359	-0,0811	0,0000	0,0000	-0,5387	0,6892
action55	-0,4535	-0,0811	0,0000	0,0270	-0,7377	-0,3108
action56	-0,4558	-0,0811	0,0000	0,0000	-0,7377	-0,3108
action57	-0,4719	-0,0811	0,0000	0,0000	-0,2942	-0,3108
action58	-0,5101	-0,0811	0,0000	0,0000	0,5958	-0,3108
action59	-0,5919	-0,0811	0,0000	0,0000	0,5958	-0,3108
action60	-0,6355	-0,0811	0,0000	0,0000	0,5958	-0,3108
action61	-0,6466	-0,0811	0,0000	0,0000	0,3587	-0,3108
action62	-0,6558	-0,0811	0,0000	0,0000	0,0276	-0,3108
action63	-0,6666	-0,0811	0,0000	0,0000	-0,5387	-0,3108
action64	-0,7218	-0,0811	0,0000	-0,0405	-0,2942	-0,3108
action65	-0,7821	-0,0811	0,0000	0,0000	-0,8839	-0,3108
action66	-0,8121	-0,0811	0,0000	0,0000	-0,5387	0,6892
action67	-0,8165	-0,0811	0,0000	0,0000	0,5958	-0,3108
action68	-0,8165	-0,0811	0,0000	0,0000	0,3587	0,6892
action69	-0,8172	-0,0811	0,0000	0,0000	-0,5387	-0,3108
action70	-0,8766	-0,0811	0,0000	0,0000	0,3587	-0,3108
action71	-0,8893	-0,0811	0,0000	0,0000	-0,5387	0,6892
action72	-0,8993	-0,0811	0,0000	0,0000	0,5958	-0,3108
action73	-0,6393	-0,0811	0,0541	0,0000	0,3587	-0,3108
action74	-0,9608	-0,0811	-0,0405	0,0000	0,0276	-0,3108
action75	-0,9294	-0,0811	-0,0946	0,0000	-0,2942	0,6892

Analysis of results: PROMETHEE-GAIA

Multicriteria Preference Flows

	Phi+	Phi-	Phi
action1	0,6048	0,0100	0,5948
action2	0,6501	0,0051	0,6450
action3	0,5918	0,0719	0,5199
action4	0,5969	0,0283	0,5686
action5	0,4578	0,1137	0,3441
action6	0,4938	0,0702	0,4236
action7	0,5108	0,1018	0,4090
action8	0,5824	0,0681	0,5143
action9	0,5359	0,0678	0,4681
action10	0,5756	0,0818	0,4938
action11	0,4674	0,1030	0,3644
action12	0,5369	0,0743	0,4626
action13	0,4783	0,1503	0,3280
action14	0,3996	0,1713	0,2284
action15	0,4102	0,1366	0,2735
action16	0,4066	0,1372	0,2694
action17	0,5755	0,1205	0,4550
action18	0,3522	0,1820	0,1702
action19	0,3410	0,1851	0,1559
action20	0,3561	0,2175	0,1386
action21	0,3916	0,1761	0,2155
action22	0,3014	0,2018	0,0997
action23	0,3183	0,1818	0,1365
action24	0,3953	0,1393	0,2560
action25	0,3833	0,2050	0,1783
action26	0,3320	0,1667	0,1653
action27	0,4046	0,1374	0,2672
action28	0,3288	0,1711	0,1577
action29	0,3280	0,1765	0,1515

Analysis of results: PROMETHEE-GAIA

Multicriteria Preference Flows

action30	0,3249	0,1785	0,1464
action31	0,3235	0,1837	0,1398
action32	0,3970	0,1567	0,2403
action33	0,3229	0,1900	0,1329
action34	0,3543	0,1964	0,1580
action35	0,3467	0,2441	0,1026
action36	0,3114	0,2767	0,0347
action37	0,2246	0,3244	-0,0998
action38	0,2228	0,3247	-0,1019
action39	0,2613	0,2718	-0,0104
action40	0,1904	0,3567	-0,1663
action41	0,1934	0,3411	-0,1478
action42	0,1794	0,3759	-0,1964
action43	0,1802	0,3624	-0,1822
action44	0,1903	0,3339	-0,1436
action45	0,1834	0,3418	-0,1584
action46	0,2681	0,2864	-0,0182
action47	0,1763	0,3375	-0,1612
action48	0,2128	0,3761	-0,1633
action49	0,1402	0,4002	-0,2600
action50	0,1610	0,3510	-0,1900
action51	0,1728	0,3378	-0,1650
action52	0,1564	0,3538	-0,1974
action53	0,1956	0,3631	-0,1675
action54	0,1823	0,3815	-0,1992
action55	0,1022	0,4331	-0,3309
action56	0,0989	0,4337	-0,3348
action57	0,1099	0,4057	-0,2957
action58	0,1494	0,3695	-0,2201

Analysis of results: PROMETHEE-GAIA

Multicriteria Preference Flows

action59	0,1311	0,3900	-0,2589
action60	0,1195	0,3990	-0,2796
action61	0,1012	0,4109	-0,3098
action62	0,0831	0,4321	-0,3490
action63	0,0561	0,4698	-0,4137
action64	0,0537	0,4721	-0,4184
action65	0,0227	0,5274	-0,5048
action66	0,0961	0,4734	-0,3774
action67	0,0780	0,4433	-0,3653
action68	0,1361	0,4210	-0,2850
action69	0,0212	0,5062	-0,4850
action70	0,0528	0,4715	-0,4187
action71	0,0843	0,4983	-0,4140
action72	0,0660	0,4705	-0,4045
action73	0,1084	0,4090	-0,3006
action74	0,0322	0,5299	-0,4977
action75	0,0908	0,5079	-0,4172

Analysis of results: PROMETHEE-GAIA

Weight Stability Intervals

Criterion	Stability Level	Weight Stability Interval
Academic Record	75	[47,31%, 47,56%]
Delegate/ Sub-Delegate	75	[10,48%, 10,75%]
Copy in exams	75	[7,99%, 11,67%]
Written Warnings	75	[7,73%, 11,24%]
Business Program	75	[10,45%, 10,57%]
Specific Activities	75	[10,42%, 10,55%]

- **Sensitivity analysis** on the relative weight of criteria allow us to study what happens to the results offered by our model.

- That is, to what extent the recommendations of the model are not affected by varying the weights (maintaining the relationship of proportionality between the remaining pesos). For the sensitivity analysis on the weight of a criterion, we can interactively analyze the overall effect of the alteration of the weighting .

- In the problem that concerns us the Dean's team has perfectly clear the weighting scheme and therefore the relative importance to be assigned to each criterion.

- Probably in the future, when more criteria are incorporated we will need to consider a sensitivity analysis to collect subjective shades of opinion of the various members of the Dean's team and we will have the final reflection in the decision criteria to be used in the assessment of students.

Robustness Analysis

- We believe that no decision analysis can be completed without having made previously robustness analysis .

- The information that we have to face in a decision problem with multiple criteria, has different levels of insufficiency, imprecision or uncertainty . Therefore, it is imperative to verify any model by means of an analysis that indicates how robust are the conclusions drawn from it.

- Before to study the robustness of the proposed model it will be very important to remember what the robustness means from the perspective of multicriteria decision.
- It is important to recognize that not always is established with precision "to what robustness refers“, as it can referred to robust solutions, robust methods, robust processes, and robust conclusions.

- In most cases, we speak of robust solutions , i.e. the focus is on solutions that are the result of a process or application of an algorithm , leading to the adoption of a decision or help the decision maker to determine what is the best compromise in the decision problem that you face.

- Therefore , the term is used to characterize robust operation of a process or the behavior of an algorithm aimed to achieve the ordering of the set of alternatives but in the presence of uncertainty. That assessment is essential , since we can not ignore the uncertainty in any decision problem , regardless of how they can manifest.

- Since our goal is to obtain a model as robust as possible , we have considered various options offered by the robustness analysis and have even studied varying levels of uncertainty in the scores of the qualitative criteria (using a quantitative scale) .

Robustness Analysis

- The margin of uncertainty associated with a given criterion is reflected by their weight stability interval.

- We have just proved that the intervals of weight stability are bounded above and below, so we can conclude that our model is strongly robust.

- In that way, any additional robustness analysis of this model could be made to varying levels of uncertainty in the weights of the criteria.

CONCLUSIONS

- Obtaining a ranking of excellence among a group of individuals is a very common problem, especially in the education field.

- To address the problem of decision consider the PROMETHEE - GAIA Methodology supported by the new software tool, Visual PROMETHEE allows us to achieve results, coherent, logical and devoid of arbitrariness.

- The methodology used in the decision problem at hand, is applied in successive stages of a process consisting of: structuring the problem, identification of criteria and alternatives or options ; evaluation of alternatives and determination of weights ; recommendations derived from the analysis of results, sensitivity and robustness .

CONCLUSIONS

- The overall ranking obtained between students of the pilot study analyzed reflects the positioning of each student respect of his peers and the priority that he/she has when choosing his/her TFG . The breakdown of the scores on the remaining criteria is an additional pattern that allows the student to recognize the absence of arbitrariness or uncertainty in the final decision .

- The detailed study of the rankings of each of the criteria, taken individually, offers students a clearer picture of those " weaknesses" in which it should do more to increase their overall rating.

- The solution obtained is logical and has a clear justification for both the students and the dean team .

- In the coming academic years the aim is to further improve the model and apply it to all degrees of the Faculty .