UTA METHODS & APPLICATIONS
PART II

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50th MCDA - Cerisy-la-Salle – France 1999

Eric Jacquet – Lagrèze remets à Bernard Roy un livre edité en son honeur

54th MCDA - Durbuy – Belgium 2001

OUTLINE

- Applications
- Other disaggregation approaches and new trends
- A real world application: Job Evaluation
- Disaggregating time series and forecasting

APPLICATIONS #1

Field	Scope	Reference
Financial management	Venture capital evaluation	Siskos and Zopounidis (1987)
	Portfolio selection and management	Hurson and Zopounidis (1997) Zopounidis et al. (1999)
	Business failure prediction	Zopounidis (1987) Zopounidis and Doumpos (1999)
	Business financing	Siskos et al. (1994) Zopounidis et al. (1996) Zopounidis and Doumpos (1998)
	Country risk assessment	Cosset et al. (1992) Oral et al. (1992) Zopounidis et al. (2000)

APPLICATIONS #2

Marketing	Marketing of new products	Spiliopoulos (1987)
	Marketing of agricultural products	Baourakis et al. (1993)
		Siskos and Matsatsinis (1993)
		Baourakis et al. (1996)
		Matsatsinis et al. (1999, 2000)
		Siskos et al. (2001)
		Matsatsinis and Siskos (2001)
		Matsatsinis and Siskos (2003)
	Consumer behavior	Siskos et al. (1995a)
		Siskos et al. (1995b)
		Baourakis et al. (1995)
		Manouselis and Matsatsinis (2001)
		Matsatsinis (2002)
	Customer satisfaction	Grigoroudis et al. (1999)
		Mihelis et al. (2001)
		Siskos et al. (2001)
		Siskos and Grigoroudis (2002)
		Grigoroudis et al. (2002)
		Grigoroudis and Siskos (2003)
		Sandalidou et al. (2003)
	Sales strategy problems	Richard (1983)
		Siskos (1986)

APPLICATIONS #3

Management (general)	Project evaluation	Jacquet-Lagrèze (1995)
		Beuthe et al. (2000)
	Environmental management	Siskos and Assimakopoulos (1989)
		Hatzinakos et al. (1991)
		Diakoulaki et al. (1999)
	Job evaluation	Spyridakos et al. (2000)
		González-Araya et al. (2002)

OTHER DISAGGREGATION METHODS AND TRENDS #1

- The ELECCALC system (Kiss *et al.*, 1994) has been developed to estimate indirectly the parameters of the **ELECTRE II** method. The process is based on the DM's responses to questions of the system regarding his/her global preferences.

- Mousseau and Slowinski (1998) propose an interactive aggregation-disaggregation approach that infers **ELECTRE TRI parameters** simultaneously starting from assignment examples. In this approach, the determination of the parameters' values (except the veto thresholds) that best restore the assignment examples is formulated through a nonlinear optimization program.

- Mousseau *et al*. (2000a; 2000b) consider the subproblem of the determination of the weights only of **ELECTRE TRI**, assuming that the thresholds and category limits have been fixed. This leads to formulate a linear program (rather than nonlinear in the global inference model). Through experimental analysis, they show that this approach is able to infer weights that restore in a stable way the assignment examples and it is also able to identify possible inconsistencies in these assignment examples.

OTHER DISAGGREGATION METHODS AND TRENDS #2

- Doumpos and Zopounidis (2002) use linear programming formulations in order to estimate all the parameters of the **outranking relation classification model**. However, in this approach, the parameters are estimated sequentially rather than through a global inference process. Thus, the proposed methodology does not specify the optimal parameters of the outranking relation (i.e. the ones that lead to a global minimum of the classification error). Therefore, the results of this approach ("reasonable" specification of the parameters) serve rather as a basis for a thorough decision-aid process.

- The problem of **robustness and sensitivity analysis**, through the extension of the previous research efforts is discussed by Dias *et al*. (2002). They consider the case where the DM can not provide exact values for the parameters of the ELECTRE TRI method, due to uncertain, imprecise or inaccurately determined information, as well as from lack of consensus among them. The proposed methodology combines the following approaches: (1) the first approach infers the value of parameters from assignment examples provided by the DM, as an elicitation aid and (2) the second approach considers a set of constraints on the parameter values reflecting the imprecise information that the DM is able to provide.

OTHER DISAGGREGATION METHODS AND TRENDS #3

- In order to represent interaction among criteria, some specific formulations of the utility functions expressed in terms of fuzzy integrals have been proposed (Murofushi and Sugeno, 1989; Grabisch, 1996; Marichal and Roubens, 2000). In this context, Angilella *et al*. (2003) propose a methodology that allows including additional information such as an interaction among criteria. The method aims at searching a utility function representing the DM's preferences, while the resulting functional form is a specific **fuzzy integral (Choquet integral)**. As a result, the obtained weights may be interpreted as the "importance" of coalitions of criteria, exploiting the potential interaction between criteria. The method can also provide the marginal utility functions relative to each one of the considered criteria, evaluated on a common scale, as a consequence of the implemented methodology.

- The general scheme of the disaggregation philosophy is also employed in other approaches, including **rough sets** (Pawlak, 1982; Slowinski, 1995; Dimitras, *et al*., 1999; Zaras, 2000), **machine learning** (Quinlan, 1986) and **neural networks** (Malakooti and Zhou, 1994; Stam *et al*., 1996). All these approaches are used to infer some form of decision model (a set of decision rules or a network) from given decision results involving assignment examples, ordinal or measurable judgments.

OTHER DISAGGREGATION METHODS AND TRENDS #4

- The **MACBETH method** (**M**easuring **A**ttractiveness by a **C**ategorical **B**ased **E**valuation **Tech**nique) by Bana e Costa and Vansnick (1994) infers a single value function from pairwise comparisons externalised from the DM on a single criterion in terms of criterion attractiveness. The same procedure is repeated for each criterion and, finally for the set of criteria in erder to infer the criteria weights. The overall evaluation model is an additive value model.

- **UTA^{GMS}** (Greco, Mousseau, Slowinski, 2008) is a UTA-like method to infer all additive value functions compatible with a set of pairwise comparisons of reference actions. The method is intended to be used interactively, with an increasing reference set A_R and a progressive statement of pairwise comparisons.

- **GRIP method** (Greco, Slowinski, Figueira, 2008) infers all additive value functions compatible with a set of pairwise comparisons of the actions (as in MACBETH) and preference intensities on pairs of actions.

A REAL WORLD APPLICATION
JOB EVALUATION IN A GREEK TELECOMUNICATION COMPANY #1

Spyridakos, A., Y. Siskos, D. Yannacopoulos and A. Skouris (2001),
Multicriteria job evaluation for large organisations,
European Journal of Operational Research, vol. 130, pp. 375-387.

The Evaluation of the Managerial Positions of a large Greek organization

a) The organization was under a re-engineering process.

b) The organization used to monopolize the products and services offered.

c) The organization was recently inserted to the Greek Stock Market

d) Recently, the organization was inserted into other neighbor countries

e) For the job evaluation a special committee of executives (directors of the main departments of the head offices) was established.

f) It was the first time that a job evaluation system was going to be established and linked to the personnel' reward system.

A REAL WORLD APPLICATION
JOB EVALUATION IN A GREEK TELECOMUNICATION COMPANY #2

THE JOB EVALUATION PROCESS : SOME EVIDENCES

Assessing a value system that encapsulates the importance of the parameters reflecting the global responsibility and duties of the jobs.

It is a systematic process that enables the design and establishment of human resources improvement procedures and fair reward systems.

It is strictly related to the job and not to its holder.

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JOB EVALUATION IN A GREEK TELECOMUNICATION COMPANY #3

It has a positive influence to:

- the establishment of a reward system that links the importance of the job to the salary offered

- the designation of human resources development requirements in order to improve the effectiveness of the position operation.

- the competence related to human resources management which is oriented to the improvement of the production or the services offered by exploiting the capacity that exists in a person so as to join the job demands

- the performance management which is based on the principles of the management by contracts or agreements.

THE JOB EVALUATION PROCESS: SOME PARTICULARITIES

- The Evaluation is the duty of a committee composed of medium and high level executives and consultants.

- There is a rather large number of conflicting factors which influence the evaluation.

- The direct job evaluation can't be supported by a step by step procedure.

- There is a wide differentiation among jobs in relation to their contribution to the results (productive and financial) of the enterprises.

- The organizations (public or private) operate in an unsettled environment.

ALTERNATIVE APPROACHES TO JOB EVALUATION
(Armstrong and Murlis, 1995; Neathey, 1994)

a) Ranking of the jobs according to the perception and their relative sizes.

b) Classification of the jobs utilising a predetermined scale.

C) Comparison of the jobs with an internal benchmark one.

D) "Point Factor Rating" : The ranking of the jobs outcomes from a simple Multiattribute additive value system.
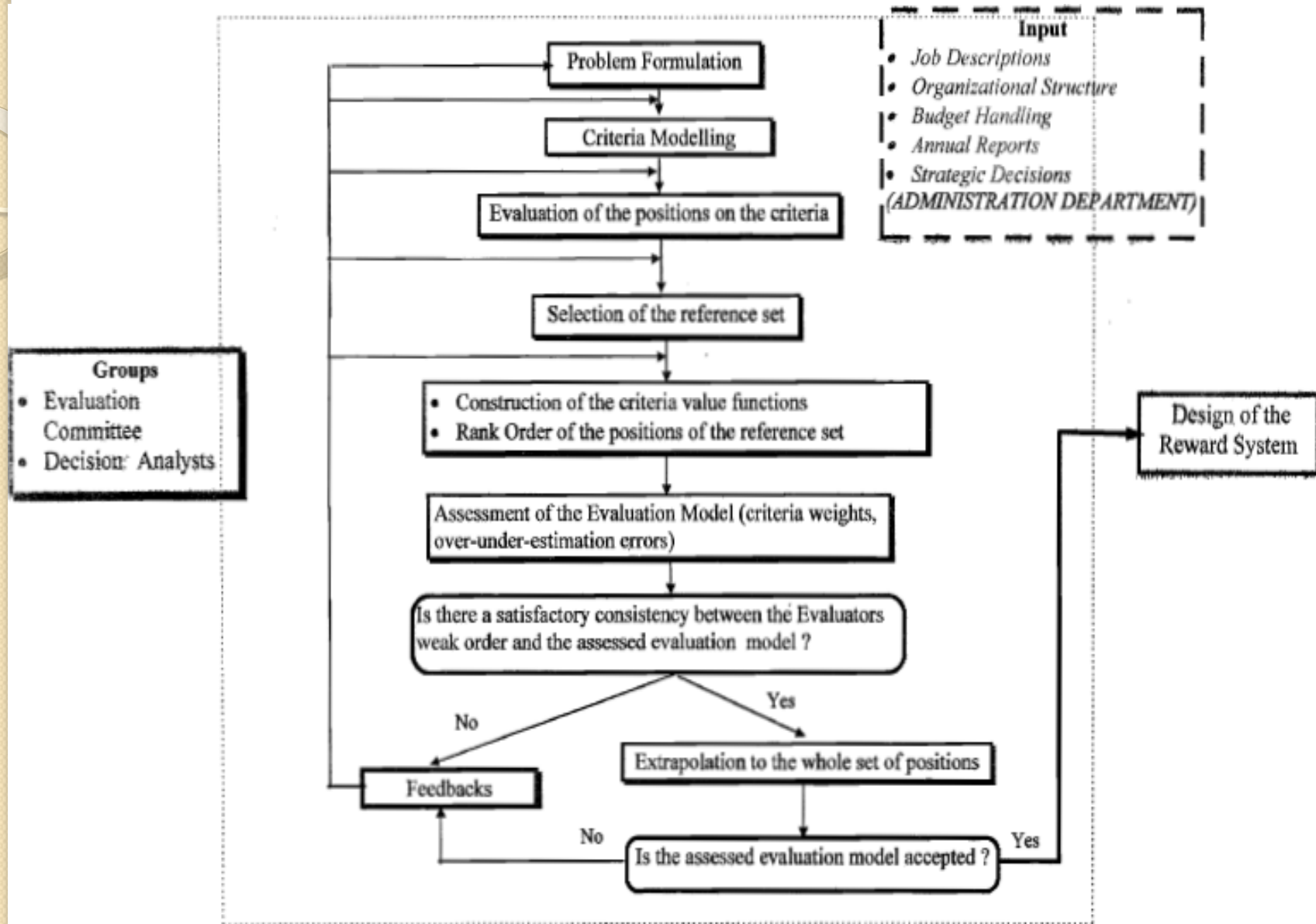
Job Evaluation Process (_spyridakis_, _Siskos_ and _Yamsasopoulos_, _1994_)
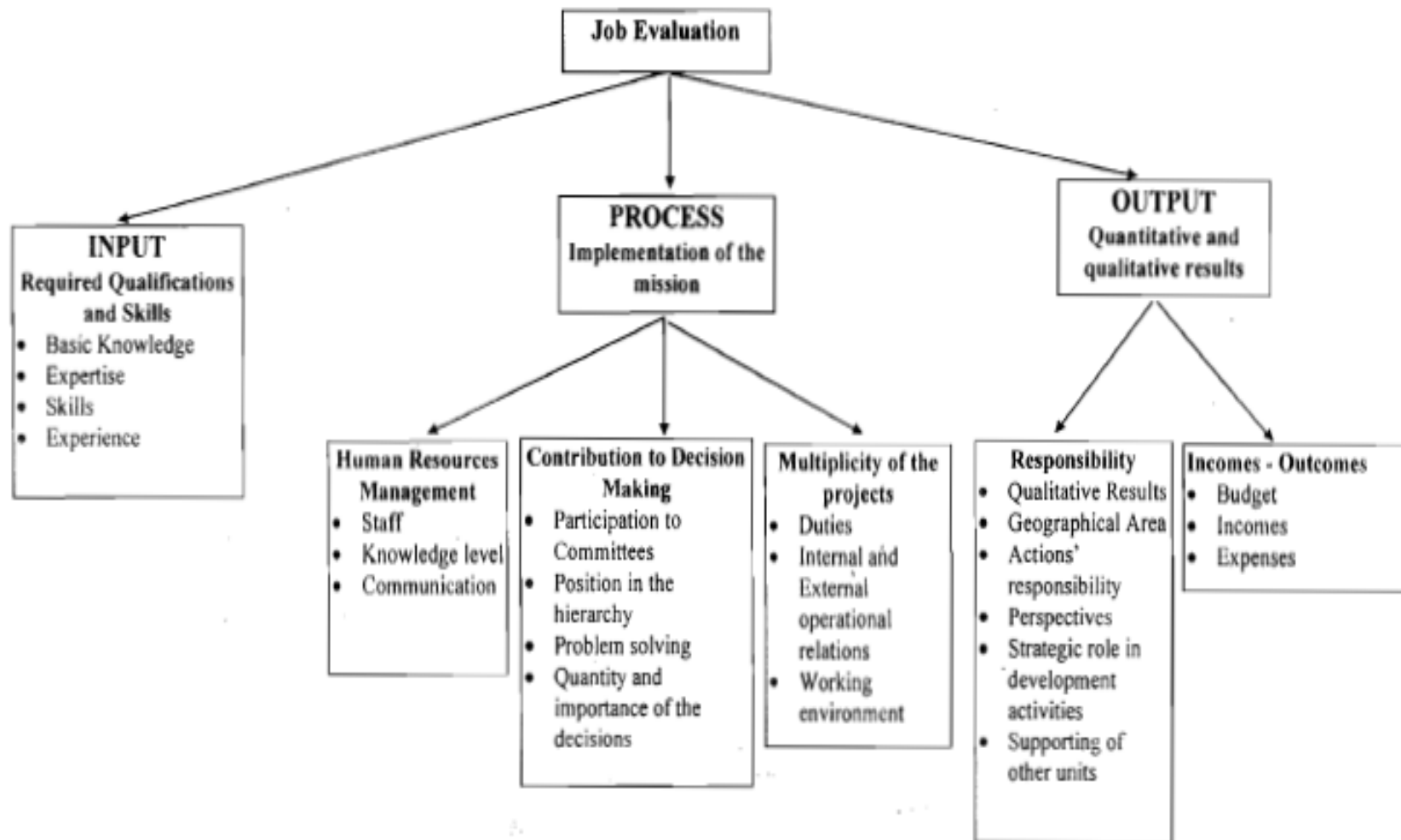
The criteria modelling

ΠΟΛΥΚΡΙΤΗΡΙΑΚΟ ΜΟΝΤΕΛΟ ΑΞΙΟΛΟΓΗΣΗΣ

$$u\,(\text{Θέση Ευθύνης}) = \sum_{j=1}^{n} P_j \cdot u_j\,(\text{Θέση Ευθύνης})$$

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JOB EVALUATION IN A GREEK TELECOMUNICATION COMPANY #9

CRITERIA MODELLING

Criterion 1 : Required Qualifications and Skills

Three characteristics have been combined for the construction of the criterion Required Qualifications and Skills.

1. Knowledge - Formal Studies

Levels	Points (Grade$_1$)
Higher (Secondary or technical school)	1
Technological Degree	3
University Degree	4
Post Graduate Studies	5

2. Skills -Expertise

Levels	Points (Grade$_2$)
Limited	1
Enough	2
Important	3

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JOB EVALUATION IN A GREEK TELECOMUNICATION COMPANY #10

3. Required Experience

Levels	Points (Grade3)
Range of 5 Years	1
Range of 10 Years	2
Range of 15 Years	3

The evaluation of a working position $v(p_i(g_i))$ is done using the following formulae:

$$v(p_i(g_i)) = 2 \times Grade_1 + Grade_2 + 2 \times Grade_3$$

Range of the criterion : $[g_{1*}, g_1^*] = [5, 21]$

Criterion 2: Human Resources Management

This criterion combines " the number of subordinates", "Knowledge level of the subordinates" and "Degree of communication between the director and the subordinates".

1: Limited	:0-35 subordinates and frequent communication or 1-100 staff and limited communication
2: Rather Limited	:35-70 subordinates and frequent communication or 100-200 staff and low communication
3: Medium	71-150 subordinates and frequent communication or 200-400 staff and least communication
4: Important	150-400 subordinates and frequent communication or 400-700 subordinates and low communication
5: Very Important	:>>400 subordinates with frequent communication and high qualification or >> 700 subordinates with least communication

A REAL WORLD APPLICATION
JOB EVALUATION IN A GREEK TELECOMUNICATION COMPANY #12

Criterion 3: Contribution to Decision Making

A scale with five degrees is used in this criterion (1:Limited, 2:Medium, 3: Rather high, 4: High, 5: Very High)

Participation to committees / Structure of decisions	Limited	Regularly	Continuously and Strongly Required
Structured	1	2	3
Semi-structured	2	3	4
Unstructured	3	4	5

Criterion 4: Multiplicity of the Projects

The evaluation of the working positions on this criterion is based on a cross margin of the characteristics "Quantity of duties and projects" and " differentiation of the projects" . A scale consisted of five degrees is used. The evaluation rules are presented in the following table:

differentiation of projects / Quantity of projects	Limited to Small	Important
Small	1	-
medium	2	4
Large	3	5

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JOB EVALUATION IN A GREEK TELECOMUNICATION COMPANY #14

Criterion 5: Responsibility

1: Limited	No strategic planning, No crucial actions, narrow geographical area, limited financial results
2: Medium	(*)
3: Rather high	(*)
4:high	(*)
5:Very high	Strategic role, Crucial actions, Wide area, Wide support of other departments, Quite high Financial results

Criterion 6: Incomes - Outcomes

A qualitative scale with five degrees was also used in this criterion because of the plurality of the different economical accounts that were used by the working positions (Expenses, Incomes, Budget, etc.). The evaluation of the working position was done by the evaluation committee supported by the decision analysts.

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JOB EVALUATION IN A GREEK TELECOMUNICATION COMPANY #16

MIIDAS in action ...

Name	1	2	3	4	5	6
Name	Qualification	Personnel	Decisions	Mult./ty	Responsibili	Financial
Preference	Increasing	Increasing	Increasing	Increasing	Increasing	Increasing
Less Pref.	5	1	1	1	1	1
Most Pref.	21	5	5	5	5	5
Type	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete

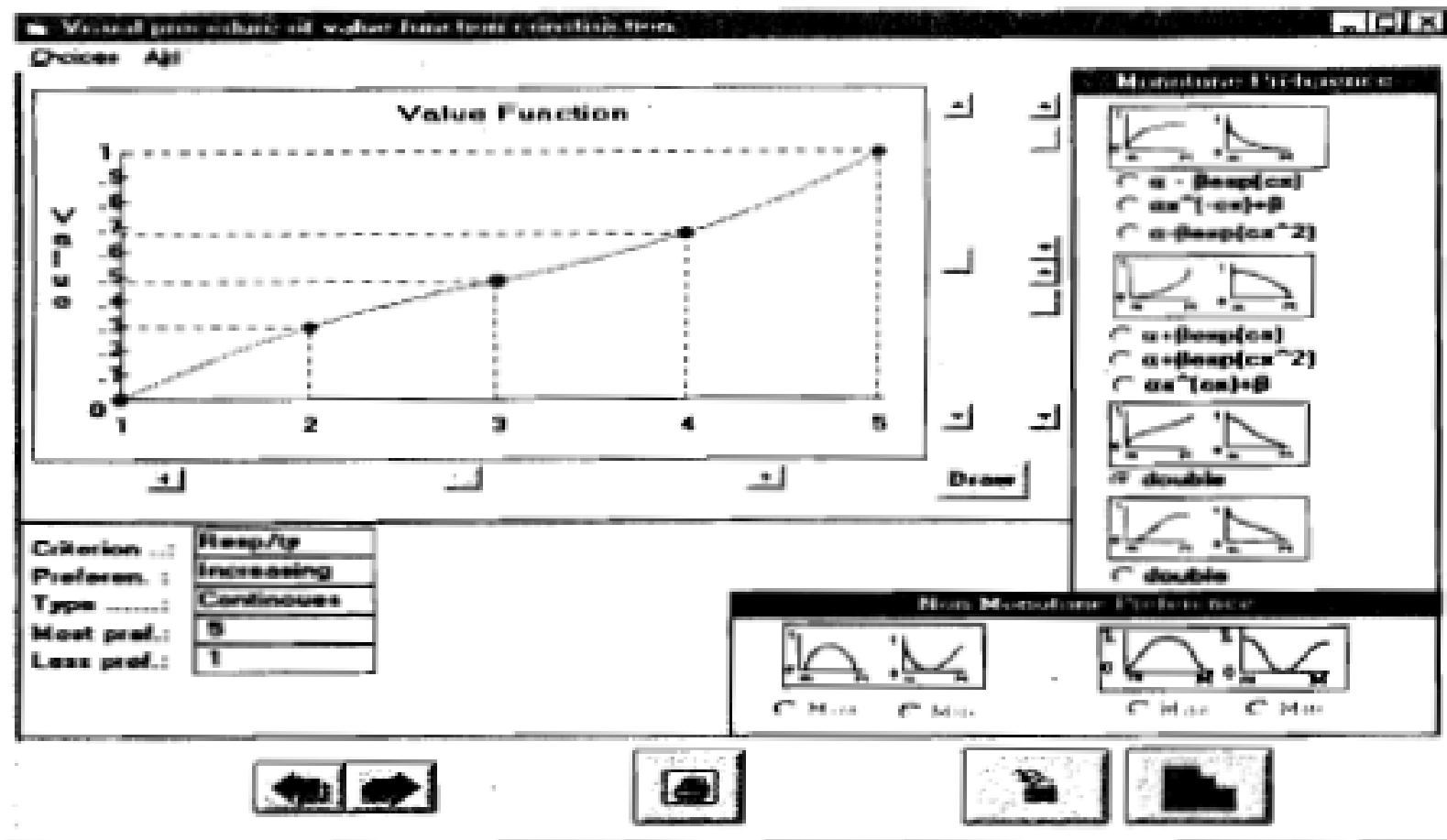|	Alternative	Qualificatio	Personnel	Decisions	Mult./ty	Responsibili	Financial
1	p-1	17	1	4	5	4	1
2	p-2	16	2	4	4	5	1
3	p-3	15	1	5	5	3	4
4	p-4	16	3	4	5	3	3
5	p-5	12	4	2	3	3	3
6	p-6	16	2	3	4	4	4
7	p-7	17	2	5	3	5	5
8	p-8	13	3	3	3	3	3
9	p-9	16	1	3	3	3	1
10	p-10	16	3	4	3	3	5
11	p-11	16	3	4	4	4	4

Required Qualifications and Skills
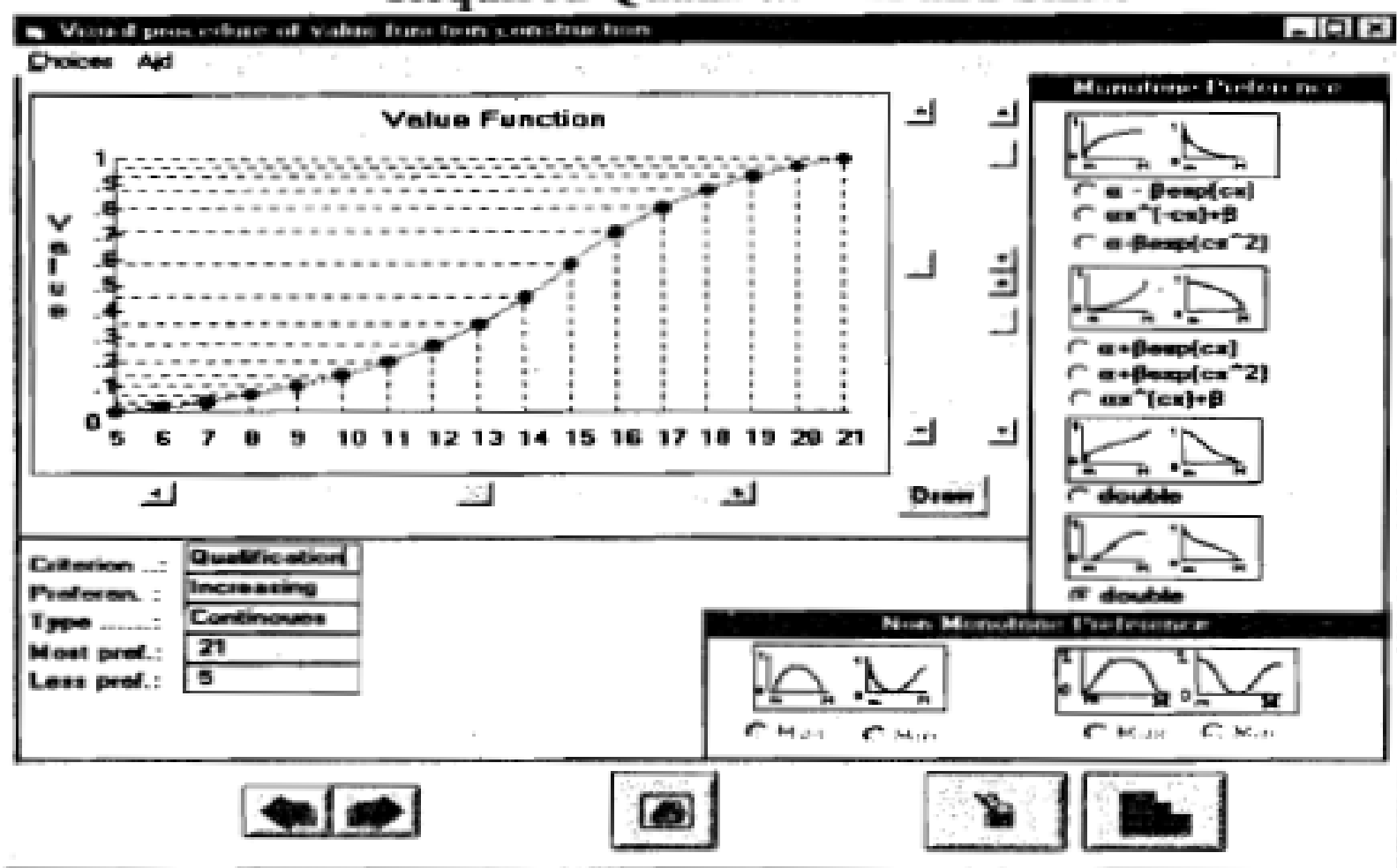
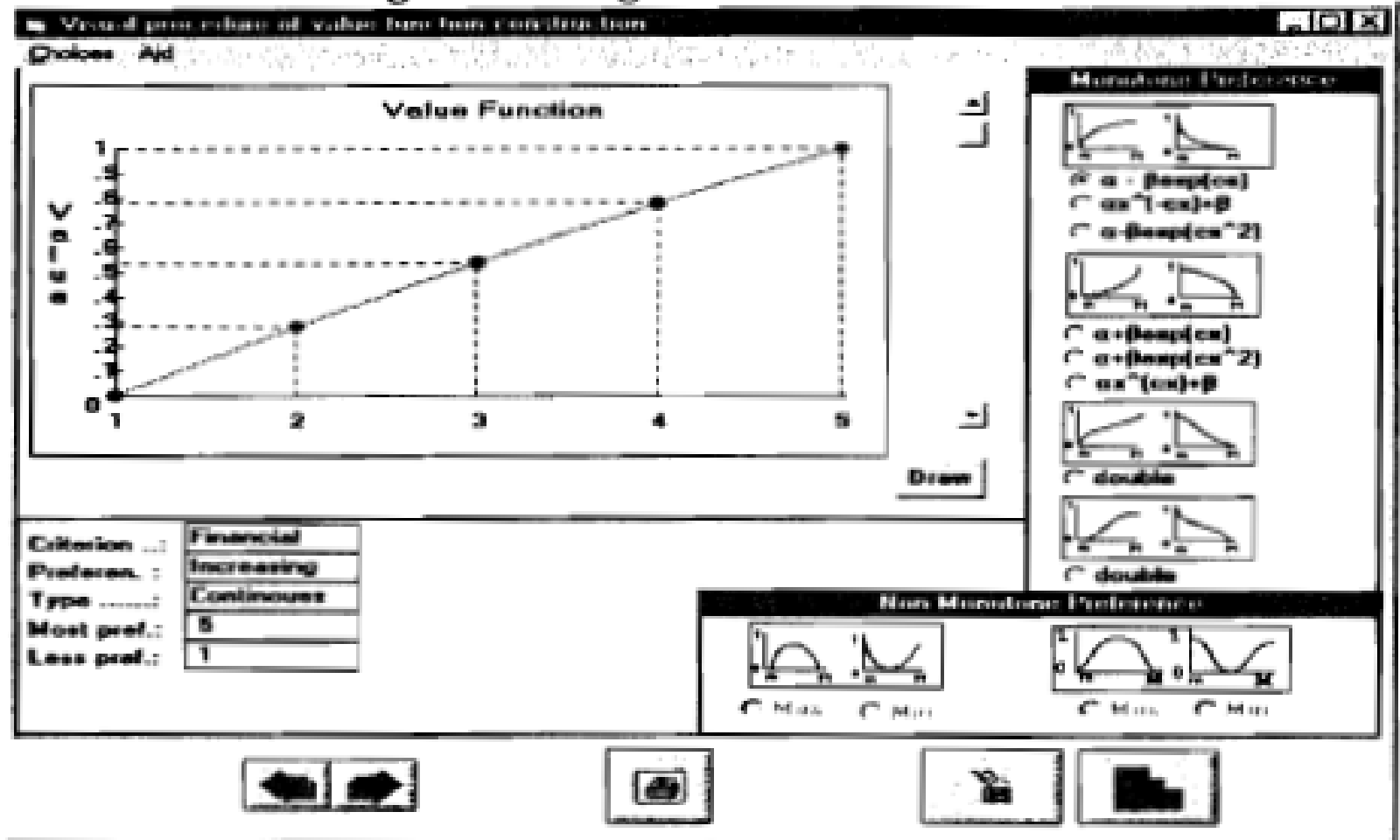# A REAL WORLD APPLICATION
JOB EVALUATION IN A GREEK TELECOMUNICATION COMPANY #18

A REAL WORLD APPLICATION
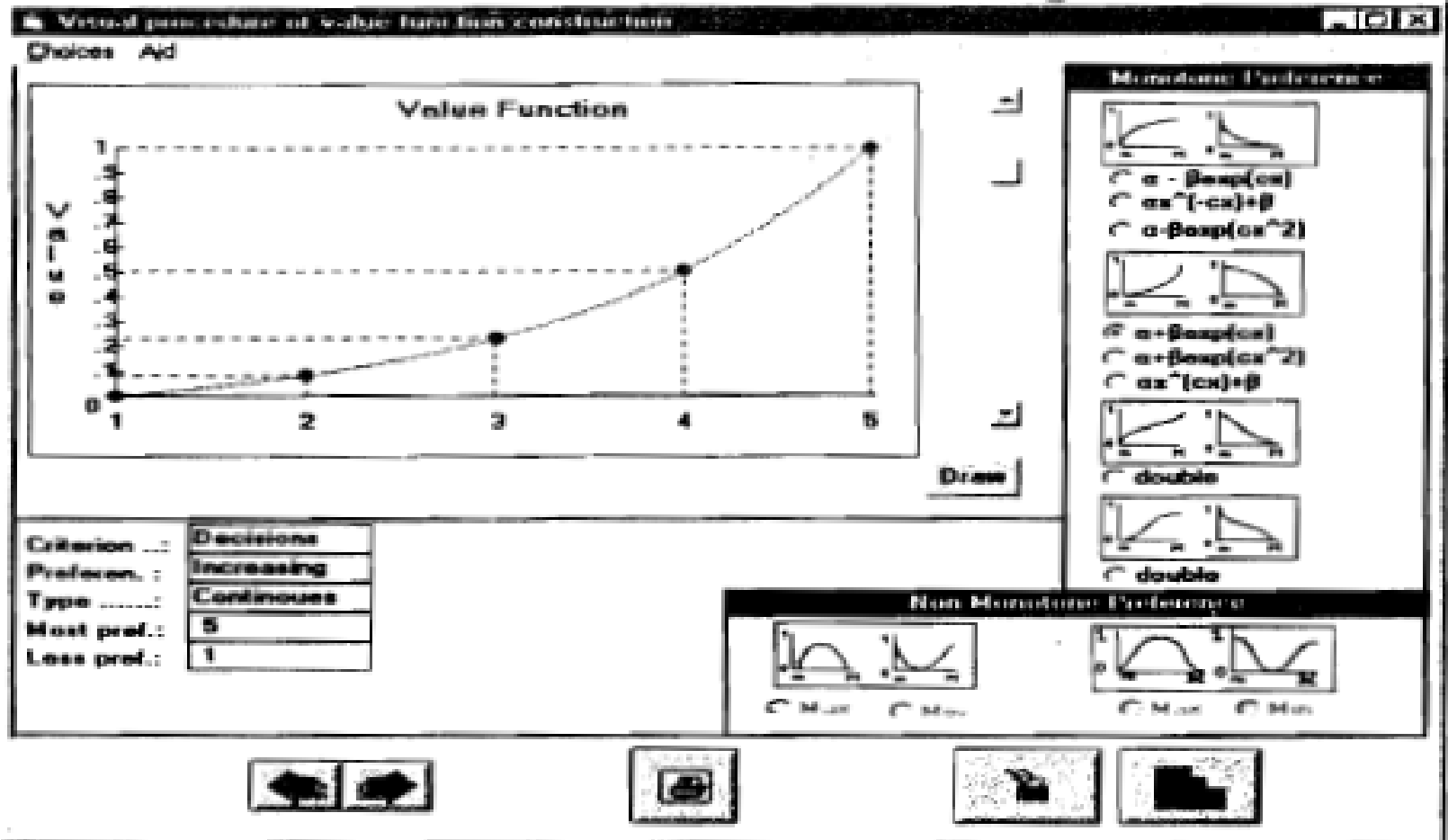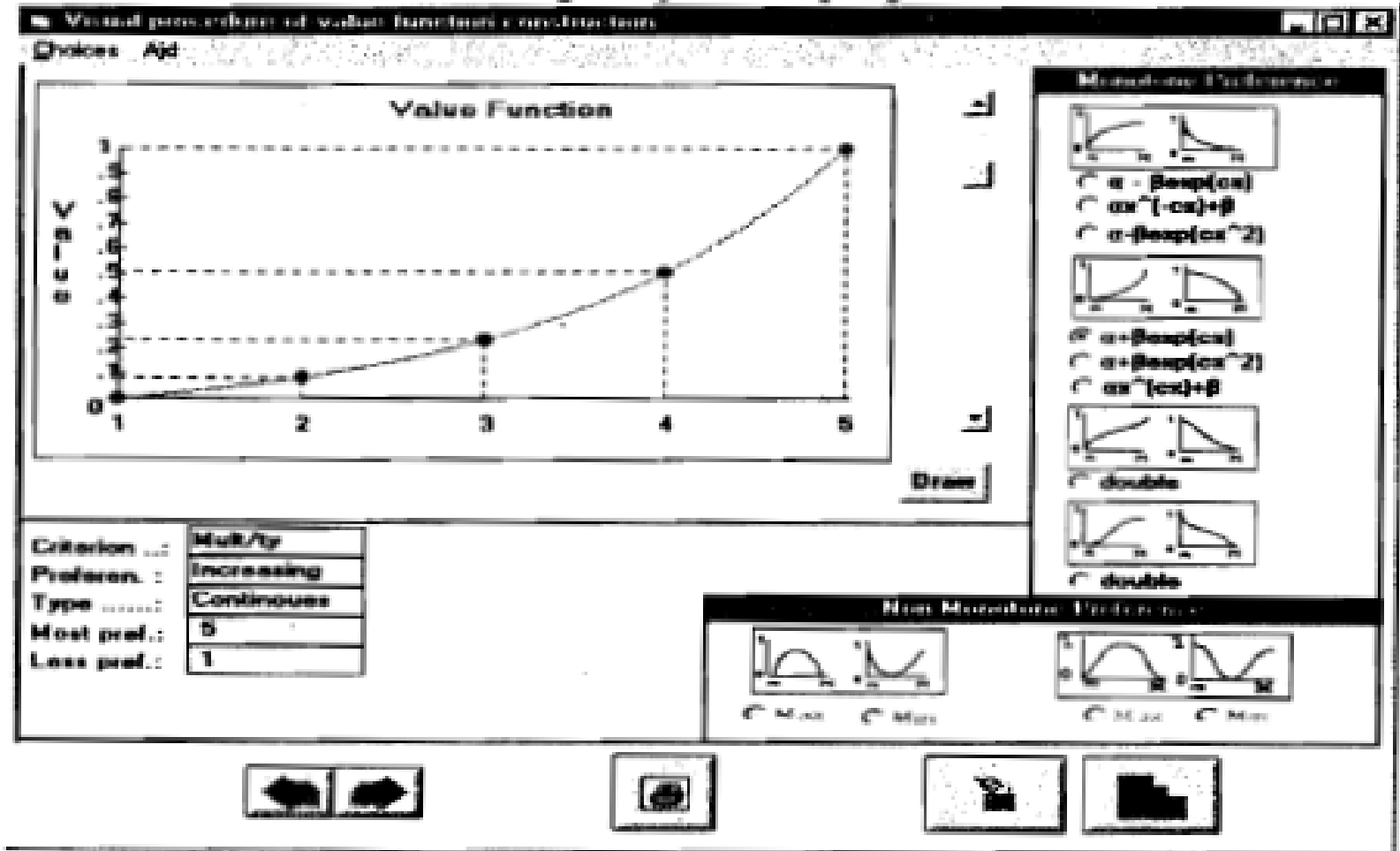## JOB EVALUATION IN A GREEK TELECOMUNICATION COMPANY #19

Budget Handling and Financial Results

Contribution to Decision Making

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JOB EVALUATION IN A GREEK TELECOMUNICATION COMPANY #21
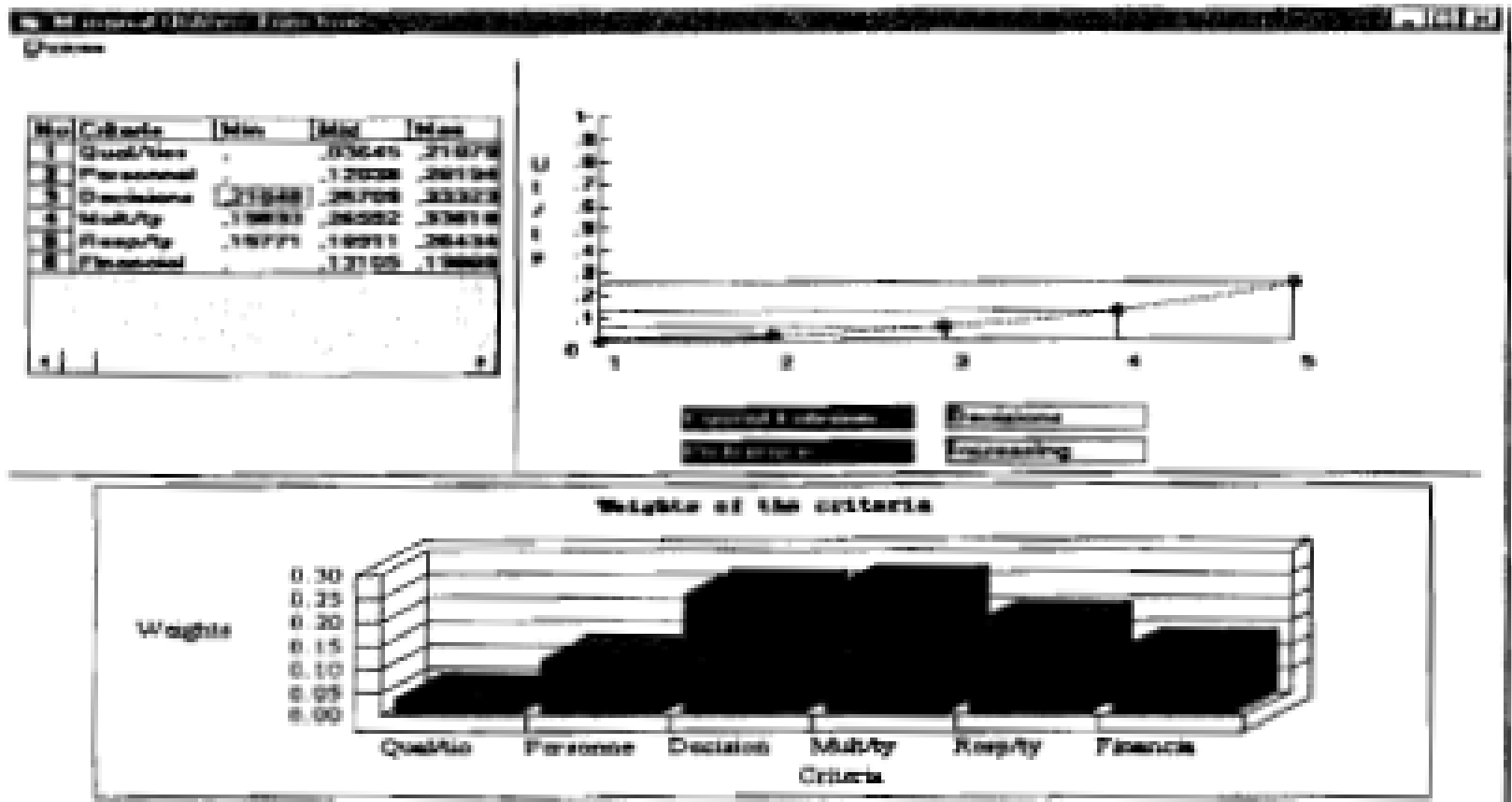
A REAL WORLD APPLICATION
JOB EVALUATION IN A GREEK TELECOMUNICATION COMPANY #22
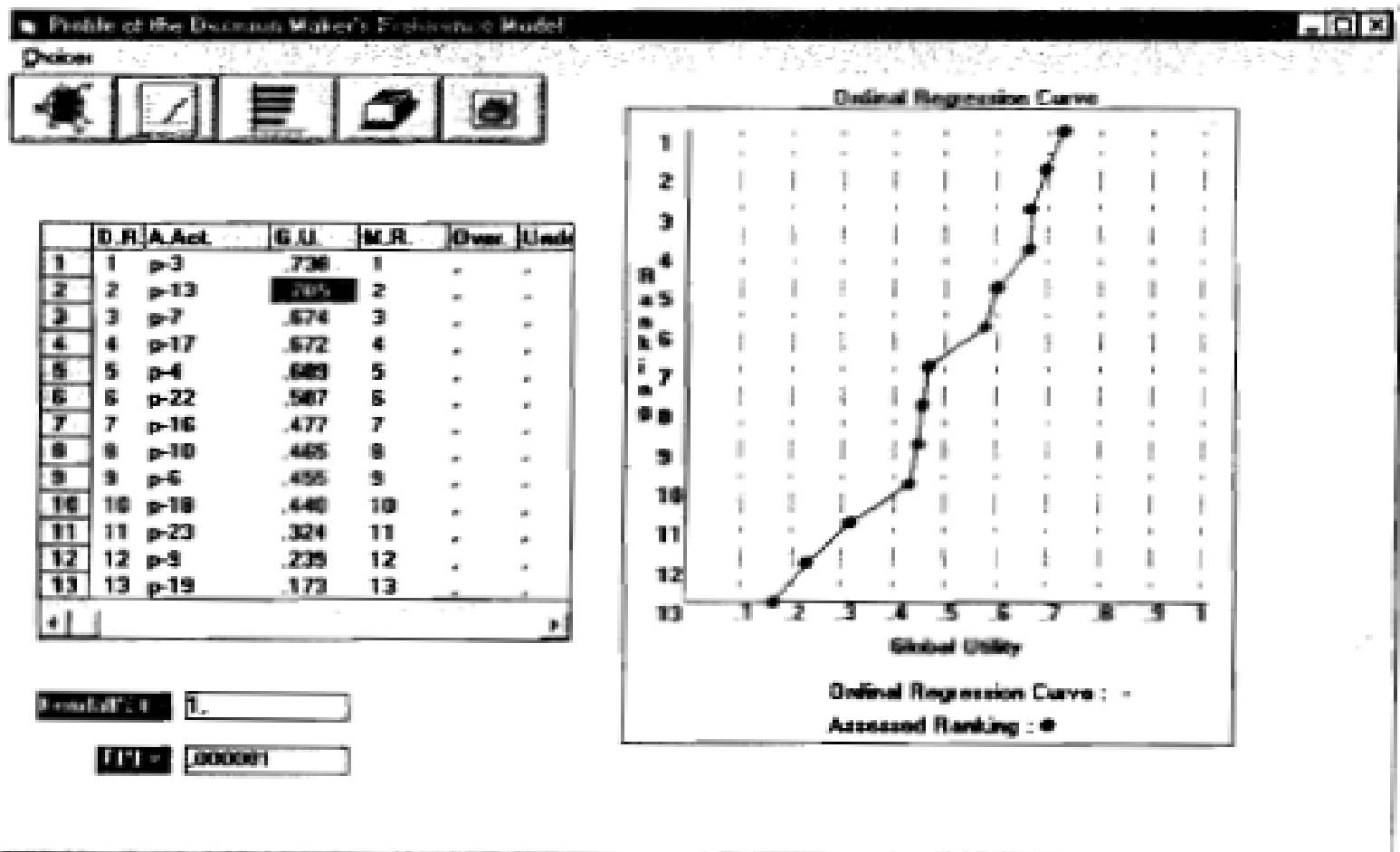

CRITERIA' WEIGHTS

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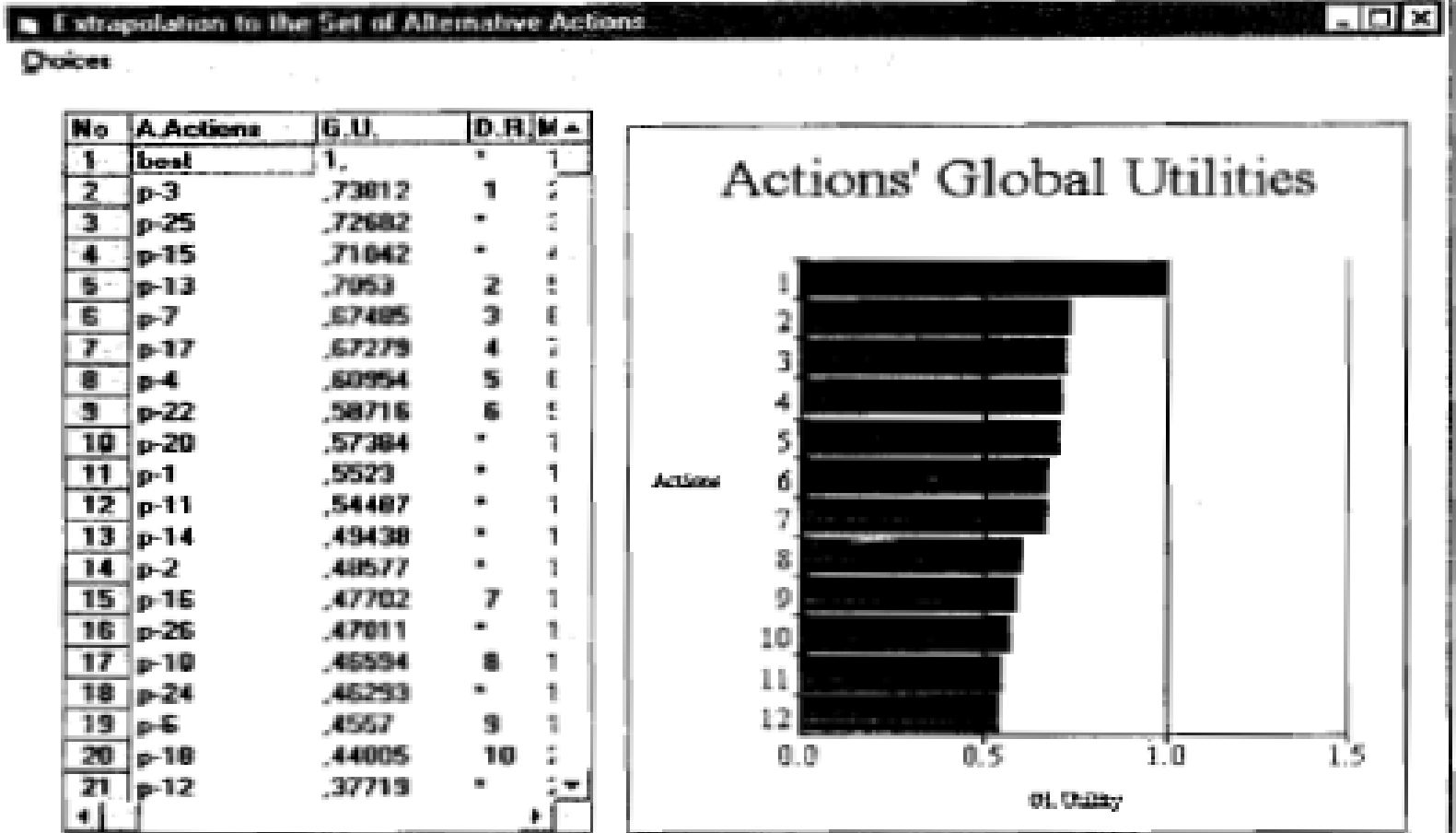## JOB EVALUATION IN A GREEK TELECOMUNICATION COMPANY #23

A REAL WORLD APPLICATION
JOB EVALUATION IN A GREEK TELECOMUNICATION COMPANY #24
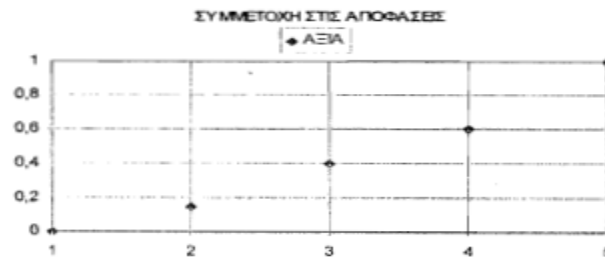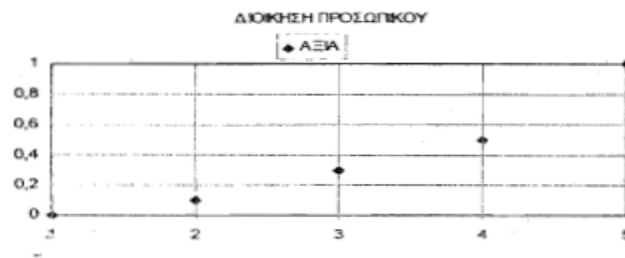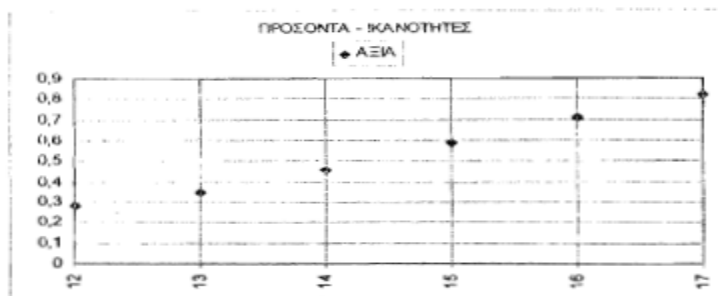
Value Functions (in Greek)
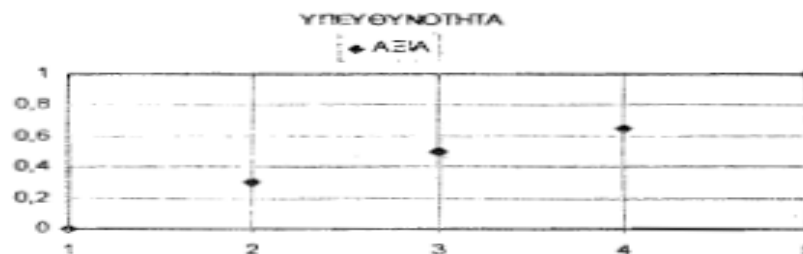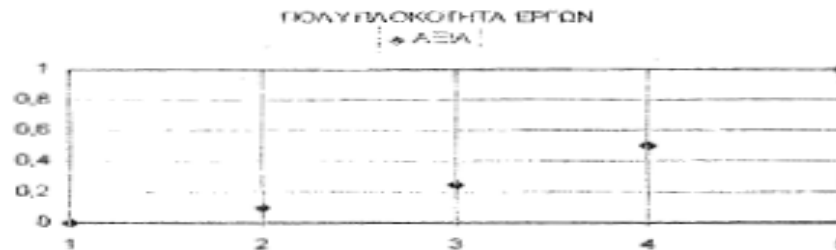
Value Functions ... continued (in Greek)

Criteria Weights (in Greek)

ΒΑΡΗ ΚΡΙΤΗΡΙΩΝ
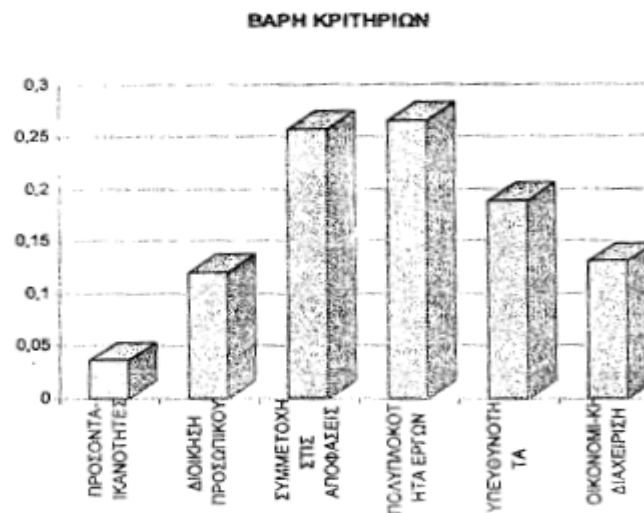
ΚΡΙΤΗΡΙΑ	ΒΑΡΗ
ΠΡΟΣΟΝΤΑ-ΙΚΑΝΟΤΗΤΕΣ	0,03645
ΔΙΟΙΚΗΣΗ ΠΡΟΣΩΠΙΚΟΥ	0,12038
ΣΥΜΜΕΤΟΧΗ ΣΤΙΣ ΑΠΟΦΑΣΕΙΣ	0,25709
ΠΟΛΥΠΛΟΚΟΤΗΤΑ ΕΡΓΩΝ	0,26592
ΥΠΕΥΘΥΝΟΤΗΤΑ	0,18911
ΟΙΚΟΝΟΜΙ-ΚΗ ΔΙΑΧΕΙΡΙΣΗ	0,13105

ΣΤ.3 ΟΛΙΚΕΣ ΧΡΗΣΙΜΟΤΗΤΕΣ ΚΑΙ ΚΑΤΑΤΑΞΗ ΤΩΝ ΘΕΣΕΩΝ ΕΥΘΥΝΗΣ

ΠΕΡΙΓΡΑΦΗ	ΟΛΙΚΗ ΧΡΗΣΙΜΟΤΗΤΑ	ΚΑΤΑΤΑΞΗ
ΠΕΡΙΦΕΡΕΙΑ ΑΤΤΙΚΗΣ	0,7536335	1
ΔΙΕΥΘΥΝΤΗΣ ΣΧΕΔΙΑΣΜΟΥ ΤΗΛΕΠΙΚΟΙΝΩΝΙΑΚΟΥ ΣΥΣΤΗΜΑΤΟΣ (Π-13)	0,736139	2
ΔΙΕΥΘΥΝΤΗΣ ΕΜΠΟΡΙΚΗΣ ΑΝΑΠΤΥΞΗΣ	0,710991	3
ΔΙΕΥΘΥΝΤΗΣ ΟΡΓΑΝΩΣΗΣ (Π-3)	0,7045955	4
ΔΙΕΥΘΥΝΤΗΣ ΔΙΕΘΝΩΝ ΣΥΝΕΡΓΑΣΙΩΝ ΚΑΙ ΕΠΕΝΔΥΣΕΩΝ (Π-7)	0,685657	5
ΠΕΡΙΦΕΡΕΙΑ ΚΕΝΤΡΙΚΗΣ ΜΑΚΕΔΟΝΙΑΣ	0,683071	6
ΔΙΕΥΘΥΝΤΗΣ ΔΙΑΧΕΙΡΙΣΗΣ ΕΙΔΙΚΩΝ ΠΕΛΑΤΩΝ (Π-17	0,6661905	7
ΠΕΡΙΦΕΡΕΙΑ ΑΝΑΤ. ΑΜΑΚΕΔΟΝΙΑΣ	0,6503085	8
ΠΕΡΙΦΕΡΕΙΑ ΣΤΕΡΕΑΣ ΕΛΛΑΔΟΣ	0,6503085	8
ΠΕΡΙΦΕΡΕΙΑ ΔΥΤΙΚΗΣ ΕΛΛΑΔΟΣ	0,6503085	8
ΔΙΕΥΘΥΝΤΗΣ ΑΝΘΡΩΠΙΝΟΥ ΔΥΝΑΜΙΚΟΥ (Π-4)	0,6422475	9
ΔΙΕΥΘΥΝΤΗΣ ΔΙΑΧΕΙΡΙΣΗΣ ΔΙΚΤΥΟΥ (Π-22)	0,6278825	10
ΔΙΑΜΕΡΙΣΜΑ ΔΥΤ. ΑΤΤΙΚΗΣ	0,622881	11
ΠΕΡΙΦΕΡΕΙΑ ΘΕΣΣΑΛΙΑΣ	0,617546	12
ΔΙΕΥΘΥΝΤΗΣ ΧΡΗΜΑΤΟ-ΟΙΚΟΝΟΜΙΚΟΥ ΣΧΕΔΙΑΣΜΟΥ ΚΑΙ ΜΕΛΕΤΩΝ (Π-20)	0,603179	13
ΠΕΡΙΦΕΡΕΙΑ ΠΕΛΟΠΟΝΝΗΣΟΥ	0,5988905	14
ΔΙΑΜΕΡΙΣΜΑ ΠΕΙΡΑΙΑ	0,5901185	15
ΔΙΕΥΘΥΝΤΗΣ ΕΠΙΧΕΙΡΗΣΙΑΚΟΥ ΣΧΕΔΙΑΣΜΟΥ (Π-1)	0,5729845	16
ΔΙΕΥΘΥΝΤΗΣ ΠΛΗΡΟΦΟΡΙΚΗΣ (Π-11)	0,5704165	17
ΔΙΑΜΕΡΙΣΜΑ ΔΥΤΙΚΗΣ ΜΑΚΕΔΟΝΙΑ	0,557356	18
ΔΙΕΥΘΥΝΤΗΣ ΚΑΤΑΣΚΕΥΩΝ	0,5426485	19
ΔΙΑΜΕΡΙΣΜΑ Β ΑΝΑΤ ΑΤΤΙΚΗΣ	0,5426485	19
ΔΙΑΜΕΡΙΣΜΑ Α' ΑΝΑΤ. ΑΤΤΙΚΗΣ	0,533962	20
ΔΙΑΜΕΡΙΣΜΑ Β ΑΘΗΝΑΣ	0,533962	20
ΠΕΡΙΦΕΡΕΙΑ ΝΗΣΩΝ	0,532702	21
ΠΕΡΙΦΕΡΕΙΑ ΒΟΡ. ΑΙΓΑΙΟΥ	0,5299525	22
ΔΙΕΥΘΥΝΤΗΣ ΠΩΛΗΣΕΩΝ	0,519236	23
ΔΙΕΥΘΥΝΤΗΣ ΝΟΜΙΚΩΝ ΥΠΗΡΕΣΙΩΝ (Π-2)	0,5142415	24

JOB EVALUATION IN A GREEK TELECOMUNICATION COMPANY #29

ΠΕΡΙΓΡΑΦΗ	ΟΛΙΚΗ ΧΡΗΣΙΜΟΤΗΤΑ	ΚΑΤΑΤΑΞΗ
ΔΙΑΜΕΡΙΣΜΑ Β ΠΕΙΡΑΙΑ	0,509886	25
ΔΙΕΥΘΥΝΤΗΣ ΠΡΟΜΗΘΕΙΩΝ (Π-10)	0,5083325	26
ΔΙΕΥΘΥΝΤΗΣ ΤΗΛΕΦΩΝΙΚΩΝ ΚΑΤΑΛΟΓΩΝ (Π-24)	0,501586	27
ΠΕΡΙΦΕΡΕΙΑ ΚΡΗΤΗΣ	0,4993055	28
ΔΙΕΥΘΥΝΤΗΣ ΔΙΕΘΝΩΝ ΕΠΙΚΟΙΝΩΝΙΩΝ (Π-6)	0,4949225	29
ΔΙΕΥΘΥΝΤΗΣ ΣΥΝΤΟΝΙΣΜΟΥ ΚΑΙ ΕΛΕΓΧΟΥ (Π-18)	0,473772	30
ΔΙΑΜΕΡΙΣΜΑ Α ΑΘΗΝΑΣ	0,467482	31
ΔΙΑΜΕΡΙΣΜΑ ΑΝΑΤΟΛΙΚΗΣ ΘΕΣ/ΚΗΣ	0,467482	31
ΔΙΑΜΕΡΙΣΜΑ Γ ΑΘΗΝΑΣ	0,4391155	32
ΔΙΑΜΕΡΙΣΜΑ ΠΑΤΡΩΝ	0,4391155	32
ΔΙΕΥΘΥΝΤΗΣ ΑΝΤΑΓΩΝΙΣΜΟΥ (Π-12)	0,3979235	33
ΠΕΡΙΦΕΡΙΑ ΗΠΕΙΡΟΥ	0,3932015	34
ΔΙΑΜΕΡΙΣΜΑ ΔΥΤΙΚΗΣ ΘΕΣ/ΚΗΣ	0,3795815	35
ΔΙΕΥΘΥΝΤΗΣ ΤΕΡΜΑΤΙΚΟΥ ΕΞΟΠΛΙΣΜΟΥ (Π-8)	0,3782675	36
ΔΙΑΜΕΡΙΣΜΑ ΗΡΑΚΛΕΙΟΥ	0,374843	37
ΔΙΕΥΘΥΝΤΗΣ ΛΟΓΙΣΤΙΚΩΝ ΥΠΗΡΕΣΙΩΝ (Π-21)	0,3495145	38
ΔΙΕΥΘΥΝΤΗΣ ΜΗΧΑΝΟΓΡΑΦΗΣΗΣ (Π-23)	0,3420805	39
ΔΙΕΥΘΥΝΤΗΣ ΔΙΟΙΚΗΤΙΚΩΝ ΥΠΗΡΕΣΙΩΝ (Π-5)	0,3355195	40
ΔΙΑΜΕΡΙΣΜΑ ΔΩΔΕΚΑΝΝΗΣΟΥ	0,322743	41
ΔΙΑΜΕΡΙΣΜΑ ΛΑΡΙΣΑΣ	0,3180045	42
ΠΡΟΪΣΤΑΜΕΝΟΣ ΥΠΗΡΕΣΙΑΣ ΕΣΩΤΕΡΙΚΟΥ ΕΛΕΓΧΟΥ (Π-9)	0,2897505	43
ΔΙΑΜΕΡΙΣΜΑ ΣΕΡΡΩΝ	0,28592	44
ΔΙΑΜΕΡΙΣΜΑ ΙΩΑΝΝΙΝΩΝ	0,276173	45
ΔΙΑΜΕΡΙΣΜΑ ΚΥΚΛΑΔΩΝ	0,276173	45
ΔΙΑΜΕΡΙΣΜΑ ΕΥΒΟΙΑΣ	0,2690475	46
ΔΙΑΜΕΡΙΣΜΑ ΒΟΙΩΤΙΑΣ	0,2376095	47
ΔΙΑΜΕΡΙΣΜΑ ΕΒΡΟΥ	0,236285	48
ΔΙΑΜΕΡΙΣΜΑ ΜΑΓΝΗΣΙΑΣ	0,236285	48
ΔΙΑΜΕΡΙΣΜΑ ΧΑΝΙΩΝ	0,236285	48
ΔΙΑΜΕΡΙΣΜΑ ΜΕΣΣΗΝΙΑΣ	0,236285	48
ΔΙΕΥΘΥΝΤΗΣ ΔΙΑΧΕΙΡΙΣΗΣ ΥΛΙΚΩΝ (Π-19)	0,2275985	49
ΔΙΑΜΕΡΙΣΜΑ ΘΕΣΠΡΩΤΙΑΣ	0,206555	50
ΔΙΑΜΕΡΙΣΜΑ ΑΡΓΟΛΙΔΑΣ	0,1977215	51
ΔΙΑΜΕΡΙΣΜΑ ΚΟΡΙΝΘΟΥ	0,1977215	51
ΔΙΑΜΕΡΙΣΜΑ ΑΡΚΑΝΑΝΙΑΣ	0,179552	52
ΔΙΑΜΕΡΙΣΜΑ ΚΑΒΑΛΑΣ	0,179552	52

A REAL WORLD APPLICATION
JOB EVALUATION IN A GREEK TELECOMUNICATION COMPANY #30

ΠΕΡΙΓΡΑΦΗ	ΟΛΙΚΗ ΧΡΗΣΙΜΟΤΗΤΑ	ΚΑΤΑΤΑΞΗ
ΔΙΑΜΕΡΙΣΜΑ ΚΟΖΑΝΗΣ	0,179552	52
ΔΙΑΜΕΡΙΣΜΑ ΤΡΙΚΑΛΩΝ	0,179552	52
ΔΙΑΜΕΡΙΣΜΑ ΧΑΛΚΙΔΙΚΗΣ	0,1736455	53
ΔΙΑΜΕΡΙΣΜΑ ΦΘΙΩΤΙΔΑΣ	0,1711295	54
ΔΙΑΜΕΡΙΣΜΑ ΑΡΚΑΔΙΑΣ	0,164959	55
ΔΙΑΜΕΡΙΣΜΑ ΔΡΑΜΑΣ	0,1626015	56
ΔΙΑΜΕΡΙΣΜΑ ΛΕΣΒΟΥ	0,155476	57
ΔΙΑΜΕΡΙΣΜΑ ΠΕΛΛΑΣ	0,155476	57
ΔΙΑΜΕΡΙΣΜΑ ΠΙΕΡΙΑΣ	0,155476	57
ΔΙΑΜΕΡΙΣΜΑ ΚΕΡΚΥΡΑΣ	0,15296	58
ΔΙΑΜΕΡΙΣΜΑ ΛΑΣΙΘΙΟΥ	0,1467895	59
ΔΙΑΜΕΡΙΣΜΑ ΗΛΕΙΑΣ	0,1409885	60
ΔΙΑΜΕΡΙΣΜΑ ΗΜΑΘΙΑΣ	0,1409885	60
ΔΙΑΜΕΡΙΣΜΑ ΑΙΤΩΛΙΑΣ	0,1227135	61
ΔΙΑΜΕΡΙΣΜΑ ΑΡΤΑΣ	0,1227135	61
ΔΙΑΜΕΡΙΣΜΑ ΚΑΡΔΙΤΣΑΣ	0,1227135	61
ΔΙΑΜΕΡΙΣΜΑ ΞΑΝΘΗΣ	0,1227135	61
ΔΙΑΜΕΡΙΣΜΑ ΠΡΕΒΕΖΑΣ	0,1227135	61
ΔΙΑΜΕΡΙΣΜΑ ΣΑΜΟΥ	0,1227135	61
ΔΙΑΜΕΡΙΣΜΑ ΧΙΟΥ	0,1227135	61
ΔΙΑΜΕΡΙΣΜΑ ΡΕΘΥΜΝΟΥ	0,1227135	61
ΔΙΑΜΕΡΙΣΜΑ ΛΑΚΩΝΙΑΣ	0,114291	62
ΔΙΑΜΕΡΙΣΜΑ ΚΑΣΤΟΡΙΑΣ	0,1106755	63
ΔΙΑΜΕΡΙΣΜΑ ΡΟΔΟΠΗΣ	0,08415	64
ΔΙΑΜΕΡΙΣΜΑ ΚΕΦΑΛΛΗΝΙΑΣ	0,0840835	65
ΔΙΑΜΕΡΙΣΜΑ ΑΡΓΟΣΑΡΩΝΙΚΟΥ	0,072112	66
ΔΙΑΜΕΡΙΣΜΑ ΖΑΚΥΝΘΟΥ	0,072112	66
ΔΙΑΜΕΡΙΣΜΑ ΚΙΛΚΙΣ	0,072112	66
ΔΙΑΜΕΡΙΣΜΑ ΦΛΩΡΙΝΑΣ	0,072112	66
ΔΙΑΜΕΡΙΣΜΑ ΓΡΕΒΕΝΩΝ	0,051321	66
ΔΙΑΜΕΡΙΣΜΑ ΕΥΡΥΤΑΝΙΑΣ	0,0127575	67
ΔΙΑΜΕΡΙΣΜΑ ΛΕΥΚΑΔΑΣ	0,0127575	67
ΔΙΑΜΕΡΙΣΜΑ ΦΩΚΙΔΑΣ	0,0127575	67

41

A REAL WORLD APPLICATION
JOB EVALUATION IN A GREEK TELECOMUNICATION COMPANY #31

CONCLUSIONS

- The job evaluation will be used for the establishment of the new reward system:

  Basic Salary
  +
  Bonus for the responsibility and importance of the position
  +
  Bonus for the performance of the position

- The Disaggregation-Aggregation methodological approach gives satisfactory results to the job evaluation problem.

- Intention for new job evaluation projects concerning the 25,000 positions and the subsidiary companies.

ΤΑ ΝΕΑ / Παρασκευή 11 Ιουνίου 1999

OIKONOMIA

71

ΠΙΛΟΤΙΚΗ ΕΦΑΡΜΟΓΗ ΤΟΥ 35ΩΡΟΥ ΕΡΓΑΣΙΑΣ

Νέο μισθολόγιο στον ΟΤΕ

Νέο σύστημα αμοιβών, με διετή εφαρμογή (1999-2000), με αυξήσεις σε τέσσερις δόσεις, ύψους 6,5%, μαζί με πιλοτική εφαρμογή του 35ώρου εργασίας, καθώς και νέο κανονισμό προσωπικού, προβλέπει η σύμβαση των εργαζομένων στον ΟΤΕ.

ΡΕΠΟΡΤΑΖ: **Ηλίας Γεωργάκης**

Τ ο κείμενο της σύμβασης υπογράφηκε χθες το βράδυ ύστερα από μαραθώνιες διαπραγματεύσεις μεταξύ της διοίκησης και της ΟΜΕ-ΟΤΕ. Το νέο μισθολόγιο στον ΟΤΕ έχει ως εξής:

● **ΚΑΤΗΓΟΡΙΕΣ ΠΡΟΣΩΠΙΚΟΥ**

Το προσωπικό εντάσσεται σε 9 μισθολογικές κατηγορίες (Προσωπικό Υποστήριξης, Δ.Ε., Δ.Ε. Δομικοί, Ραδιοτηλεγραφητές, Τ.Ε., Π.Ε. 4, Π.Ε. 5, Εξειδικ. Master και Εξειδικ. Doctora), αναλόγως της στάθμης εκπαίδευσης.

Συμφωνίες διοίκησης και ΟΜΕ-ΟΤΕ ύστερα από μαραθώνιες διαπραγματεύσεις

● **ΕΞΕΛΙΞΗ ΠΡΟΣΩΠΙΚΟΥ**

Το προσωπικό εξελίσσεται σε 17 μισθολογικές βαθμίδες ανά διετία

● Ο δηματισμός από βαθμίδα σε βαθμίδα γίνεται ως εξής:

Από 1-5 μισθολογική βαθμίδα 2%.
Από 6-12 μισθολογική βαθμίδα 2,5%.

Από 13-17 μισθολογική βαθμίδα 2%.

● Στις μισθολογικές βαθμίδες ενσωματώνονται, καταργούμενα: το διορθωτικό ποσό, η

ΑΤΑ, τα επιδόματα πτυχίων (σπουδών), το επίδομα ανώτατου προσωπικού (75.000).

Το χρονοεπίδομα υπολογίζεται στην τρέχουσα μισθολογική βαθμίδα.

Τα λοιπά τακτικά επιδόματα υπολογίζονται στην εισαγωγική μισθολογική βαθμίδα της κατηγορίας του Προσωπικού Υποστήριξης.

Το οικογενειακό επίδομα υπολογίζεται στην εισαγωγική μισθολογική βαθμίδα της κατηγορίας Δ.Ε. (227.000), αλλά το ποσοστό για το τρίτο παιδί και άνω αυξάνεται κατά 2 ποσοστιαίες μονάδες.

Ένταξη προσωπικού

Το προσωπικό εντάσσεται με τα χρόνια πραγματικής υπηρεσίας, όπως αυτή προσδιορίζεται σήμερα, στην περίπτωση δε που υπολείπεται των αποδοχών του εντάσσεται με τις αποδοχές του, και δεν θα λαμβάνει σε καμία περίπτωση αύξηση αποδοχών μικρότερο από 5% στη διετία 1999 και 2000.

● **ΠΑΓΙΑ ΑΜΟΙΒΗ**

Πρόσθετη αμοιβή στους προϊσταμένους Θέσεως Ευθύνης σε ποσοστό πάνω στην 17η μισθολογική βαθμίδα της κατηγορίας Doctora,

Οι νέες μισθολογικές βαθμίδες στον ΟΤΕ

Εισαγωγικές βαθμίδες ανά κατηγορία:

Προσωπικό Υποστήριξης	185.000 δρχ.
Δ.Ε.	220.000 δρχ.
Δ.Ε. Δομικοί	227.000 δρχ.
Ραδ/τες	232.000 δρχ.
Τ.Ε.	260.000 δρχ.
Π.Ε. 4	270.000 δρχ.
Π.Ε. 5	290.000 δρχ.
Εξειδικ. Master	310.000 δρχ.
Εξειδικ. Doctora	350.000 δρχ.

προσαυξημένη με το μεγαλύτερο ποσοστό χρονοεπιδόματος ως εξής:

Α) 35% στους προϊσταμένους των Κεντρικών και Περιφερειακών Διευθύνσεων.

Β) 25% στους προϊσταμένους Διαμερισμάτων, Συγκροτημάτων και Τμημάτων Κεντρικών Διευθύνσεων.

Γ) 15% στους προϊσταμένους Εμπορικών και Τεχν. Τμημάτων της Περιφέρειας.

Ισχύς από 1/7/1999

● **BONUS**

Ανάλογα με το ποσοστό επίτευξης στόχων.

Ισχύς από το έτος 2000

Καταβολή αυξήσεων

Οι διαφορές αποδοχών (αυξήσεις) θα καταβληθούν σε τέσσερις ισόποσες δόσεις στις: 1/4/99, 1/12/99, 1/4/2000 και 1/12/2000

Για το 35ωρο εργασίας η σύμβαση προβλέπει την πιλοτική εφαρμογή του σε δέκα καταστήματα από την 1/10/1999, τα οποία θα επιλεγούν από τη διοίκηση και την ΟΜΕ-ΟΤΕ, καθώς και τη σύσταση κοινής επιτροπής η οποία θα εξετάσει τα αποτελέσματα της πιλοτικής εφαρμογής.

Επίσης, υπήρξε συμφωνία για την κατάρτιση νέου Γενικού Κανονισμού Προσωπικού ΟΤΕ. Κύριο χαρακτηριστικό του νέου κανονισμού είναι η ευελιξία που δίνεται στη διοίκηση για να διαχειρίζεται καλύτερα το ανθρώπινο δυναμικό (π.χ. μετακίνηση υπαλλήλων από ειδικότητα σε ειδικότητα ή σε παρεμφερή εργασία κ.ά.). Παράλληλα κατοχυρώνονται οι εργασιακές σχέσεις, καθώς και η διαδικασία επιλογής του ανώτατου προσωπικού.

Εξάλλου, με τον νέο κανονισμό προσωπικού:

● Αλλάζουν οι βαθμοί και γίνονται 5 από 15.
● Διατηρείται το καθεστώς αδειών και βασικών επιδομάτων (π.χ. χρονοεπίδομα).
● Διατηρείται ο υπολογισμός του χρονοεπιδόματος.
● Θεσμοθετείται η νέα ειδικότητα του εξειδικευμένου προσωπικού.
● Διατηρούνται τα υπηρεσιακά συμβούλια (προαγωγών, πειθαρχικό κ.ά.).

Η νέα σύμβαση στον ΟΤΕ προκάλεσε εσωτερικές τριβές στην ηγεσία της ΟΜΕ-ΟΤΕ, καθώς ορισμένοι συνδικαλιστές της αντιπολίτευσης αμφισβήτησαν ότι υπάρχει κατά πλειοψηφία εξουσιοδότηση της Ε.Ε. για υπογραφή.

Ωστόσο η ΠΑΣΚΕ (στην οποία υπάρχουν δύο μέλη της που διαφωνούν με τη σύναψη αυτής της σύμβασης και προέρχονται από τον χώρο των μηχανικών) υποστήριξε ότι στην ψηφοφορία που έγινε την Τετάρτη το βράδυ δόθηκε έγκριση για συμφωνία με ψήφους 17 υπέρ, έναντι 16 κατά, με διαρροή δύο ψήφων από τη ΔΑΚΕ (Ν.Δ.).

Disaggregating time series and forecasting
Angelopoulos, Psarras, Siskos (2018)

Main Research Objectives

- Introduction of an *original robust multicriteria forecasting approach*;

- Examination of the *relationship* between electricity demand time series and several multiple criteria;

- Implementation of *post-optimality analysis and robustness control* of the applied forecasting model;

- *Application* of the model for long-term electricity demand forecasting in Greece.

Notation

Y	Time series variable
α	Number of equidistant levels of scale of Y values
y^m	The mth level of Y (m=1,2,...,α)
n	Number of criteria
X_i	Value of the ith criterion (i=1,2,...,n)
α_i	Number of levels of the ith criterion values
x_i^k	The kth level of the ith criterion (k=1,2,...,α_i)
Y^*	Value function of Y
y^{*m}	Value of the y^m level
X_i^*	Marginal value function of X_i
x_i^{*k}	Value of the x_i^k level
T	Time horizon

Methodology

Classic Model (1/3)

- Inspired from the study of Kettani, Oral & Siskos (1998)

The first disaggregation model is given below:

$$Y = b_0 + \sum_{i=1}^{n} b_i X_i^*$$

and

$$x^{*1} = 0, \quad x_i^{*ai} = 1 \ for \ i = 1, 2, \dots, n$$

The ordinal regression equation is formed as follows:

$$\tilde{Y} = b_0 + \sum_{i=1}^{n} b_i X_i^* - \sigma^+ + \sigma^-$$

Where σ^+ and σ^- constitute the overestimation and the underestimation errors, respectively.

Methodology

Classic Model (2/3)

The classic time series disaggregation model is inferred by means of the following linear programming model:

$$
\begin{cases}
[min]F = \sum_{j=1}^{T} (\sigma_j^+ + \sigma_j^-) \\
under\ the\ following\ constraints \\
b_0 + \sum_{t=1}^{n} \sum_{k=1}^{\alpha_i-1} c_{ij}^k\, w_{ik}' - \sigma_j^+ + \sigma_j^- = y_j - \sum_{i=1}^{n} \gamma_i \sum_{k=1}^{\alpha_i-1} c_{ij}^k \ \ for\ j = 1,2,\dots,T \\
\\
b_0, w_{ik}', \sigma_j^+, \sigma_j^- \geq 0 \ \ for\ \ \forall\, i,k,j
\end{cases}
$$

Methodology

Value-based Model (1/4)

- Inspired from the studies of Grigoroudis and Siskos (2002, 2010)

The form of the ordinal regression analysis equation is given below ($b_0 = 0$):

$$\begin{cases} Y^* = \sum_{i=1}^{n} b_i X_i^* \\ \sum_{i=1}^{n} b_i = 1 \end{cases}$$

The following constraints hold:

$$y^{*1} = 0 \ and \ y^{*\alpha} = 1$$

The ordinal regression equation is formed as follows: $\tilde{Y}^* = \sum_{i=1}^{n} b_i X_i^* - \sigma^+ + \sigma^-$

Methodology

Value-based Model (2/4)

The value-based time series disaggregation model is inferred by means of the linear programming model given below:

$$[min]F = \sum_{j=1}^{f} (\sigma_j^+ + \sigma_j^-)$$

$under\ the\ following\ constraints$

$$\sum_{t=1}^{n} \sum_{k=1}^{a_i-1} c_{ij}^k w'_{ik} - \sum_{m=1}^{\alpha-1} c_j^m z'_m - \sigma_j^+ + \sigma_j^- = \gamma \sum_{m=1}^{\alpha-1} c_j^m - \sum_{i=1}^{n} \gamma_i \sum_{k=1}^{\alpha_i-1} c_{ij}^k \ for$$

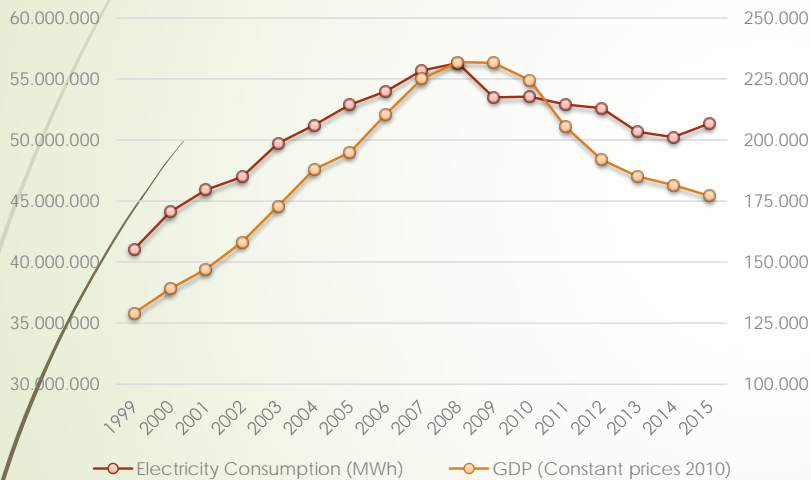$$\sum_{m=1}^{\alpha-1} z'_m = 1 - \gamma(\alpha - 1)$$

$$\sum_{i=1}^{n} \sum_{k=1}^{\alpha_i-1} w'_{ik} = 1 - \sum_{i=1}^{n} \gamma_i (\alpha_i - 1)$$

$$z'_m, w'_{ik}, \sigma_j^+, \sigma_j^- \geq 0 \quad \forall\, m, i, k, j$$

Long-term electricity demand forecasting in Greece

Economic Crisis in Greece (2008 and beyond)

- Electricity Consumption (MWh)
- GDP (Constant prices 2010)

➥ Reduction of GDP by and increase of unemployment rate to 27.5% in 2013;

➥ Reduction of electricity demand by more than % from 2008 to 2014.

- Unemployment Rate

Long-term electricity demand forecasting in Greece

Forecasting Model Criteria

Criteria	Measurement Unit	Scale	Sources
Economic criteria			
Gross Value Added per Economic Sector (g_8, g_{10-18})	Million € (at constant prices)	129,000 – 231,000	EL.STAT.
Unemployment rate (g_9)	%	7.8% - 27.5%	EUROSTAT
Demographic criterion			
Population (g_6)	Persons	10,883,000 – 11,397,000	OECD
Weather-related criteria			
Heating Degree Days (g_4)	Days	1,650 – 2,050	HNMS
Cooling Degree Days (g_5)	Days	240 - 420	HNMS
Energy-related criteria			
Electricity price (g_1)	€/kWh	0.076 – 0.178	OECD/IEA
Natural Gas price (g_2)	€/10^7 kilocalories GCV	275 - 980	OECD/IEA
Light Fuel Oil price (g_3)	€/10^3 liters	325 – 1,270	OECD/IEA
Energy efficiency criterion			
ODEX Indicator (g_7)	%	77 - 101	ODYSSEE-MURE

Case Study

Forecasting Model Versions

Model	Description
Version A	Economic, demographic, weather-related and energy-related criteria are taken into consideration. Use of GDP in constant prices.
Version B	Economic, demographic, weather-related, energy-related and energy efficiency criteria are taken into consideration. Use of GDP in constant prices.
Version C	Economic, demographic, weather-related and energy-related criteria are taken into consideration. Use of the Gross Value Added per sector of activity instead of the GDP.
Version D	Economic, demographic, weather-related, energy-related and energy efficiency criteria are taken into consideration. Use of the Gross Value Added per sector of activity instead of the GDP.
Version E	Robust post-optimality optimization version of Model D

Results

Forecasts (Period 2000-2015)
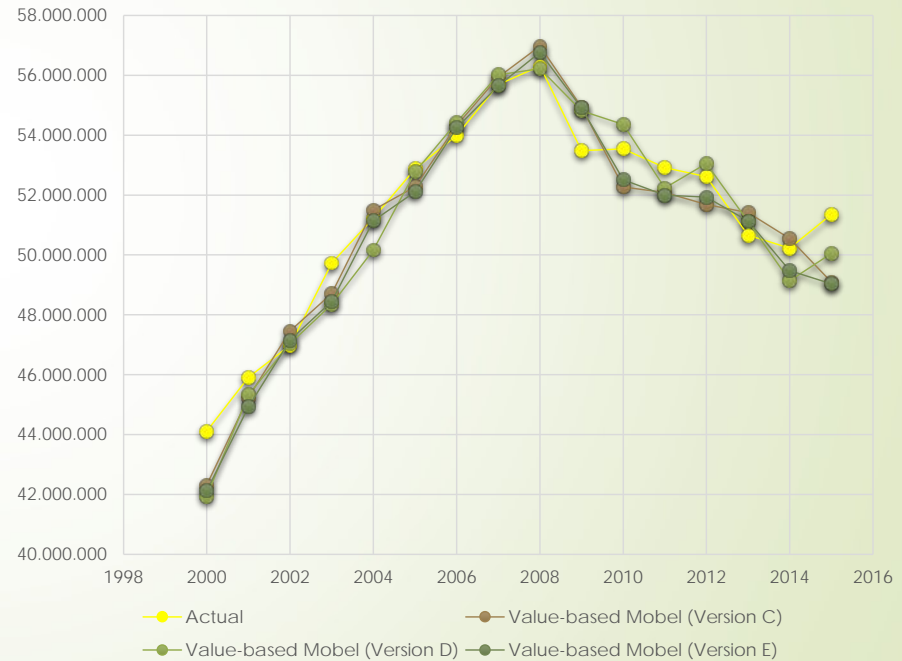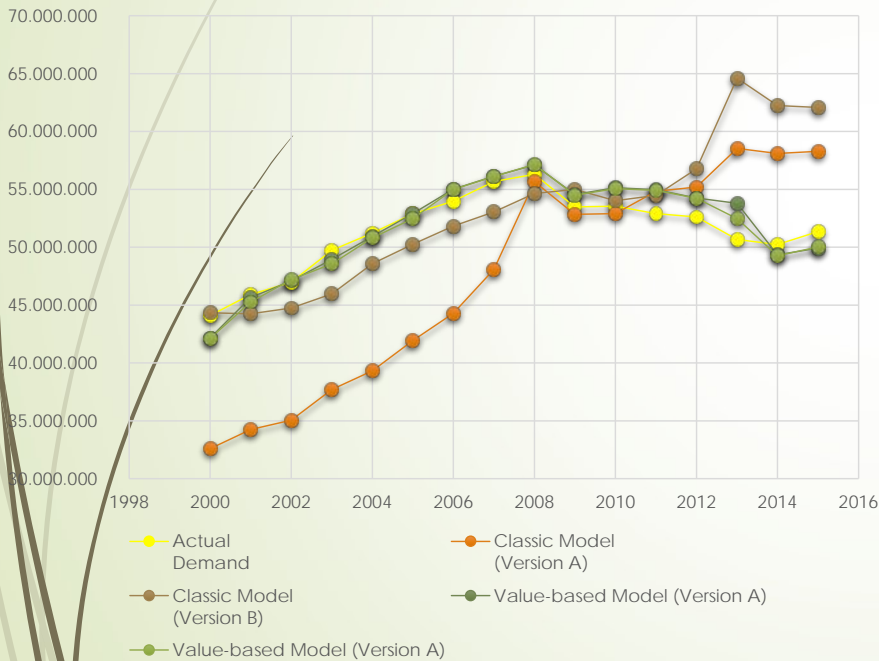
Results

Statistical Errors (Period 2000-2015)

| Indicator	Classic Model (Version A)	Classic Model (Version B)	Value-based Model (Version A)	Value-based Model (Version B)	Value-based Model (Version C)	Value-based Model (Version D)	Value-based Model (Version E)
MFE	3.88E+06	-1.58E+06	-3.97E+05	-2.22E+05	3.03E+05	2.86E+05	5.04E+05
MAE	7.28E+06	4.00E+06	1.09E+06	1.09E+06	8.71E+05	7.69E+05	8.53E+05
MPE	7.93%	-3.11%	-0.69%	-0.34%	0.64%	0.63%	1.04%
MAPE	14.59%	7.83%	2.14%	2.13%	1.72%	1.54%	1.70%
RMSE	8.49E+06	5.74E+06	1.36E+06	1.23E+06	1.03E+06	9.53E+05	1.06E+06
r	62.9%	47.3%	96.2%	97.2%	96.8%	98.2%	97.5%

Results

Forecasts (Period 2016-2025)
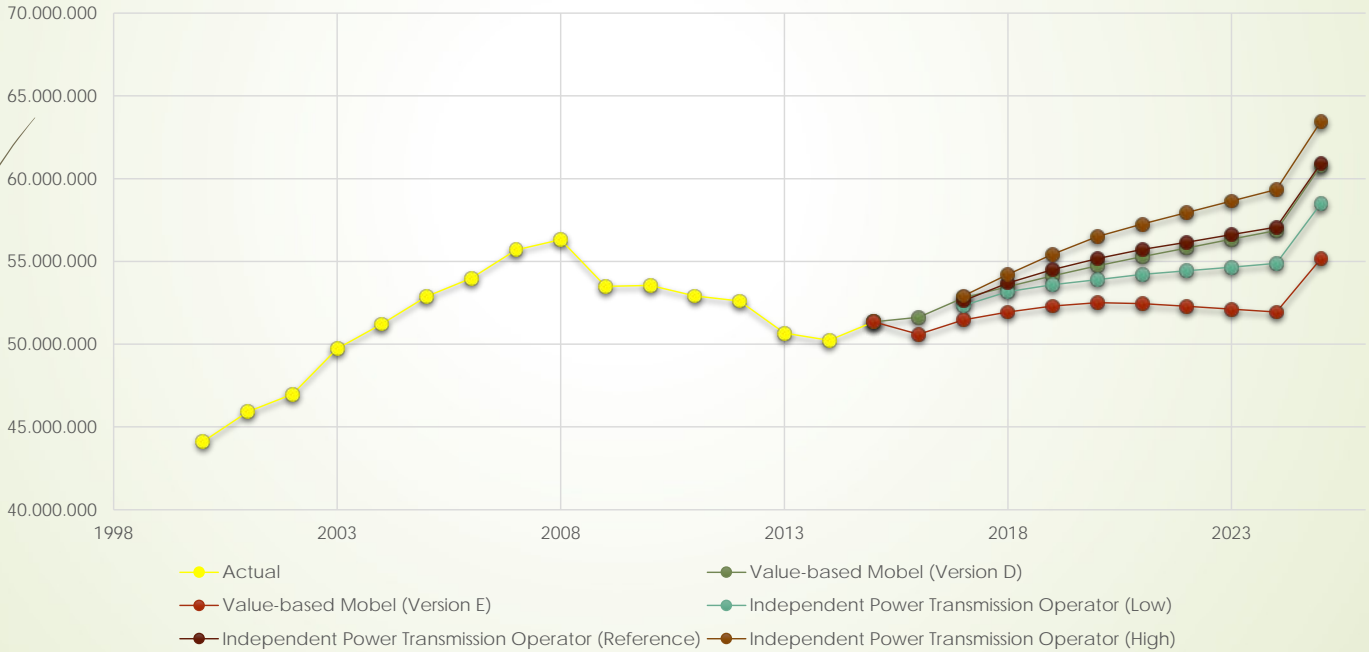
Results

Weights of the Model's Criteria
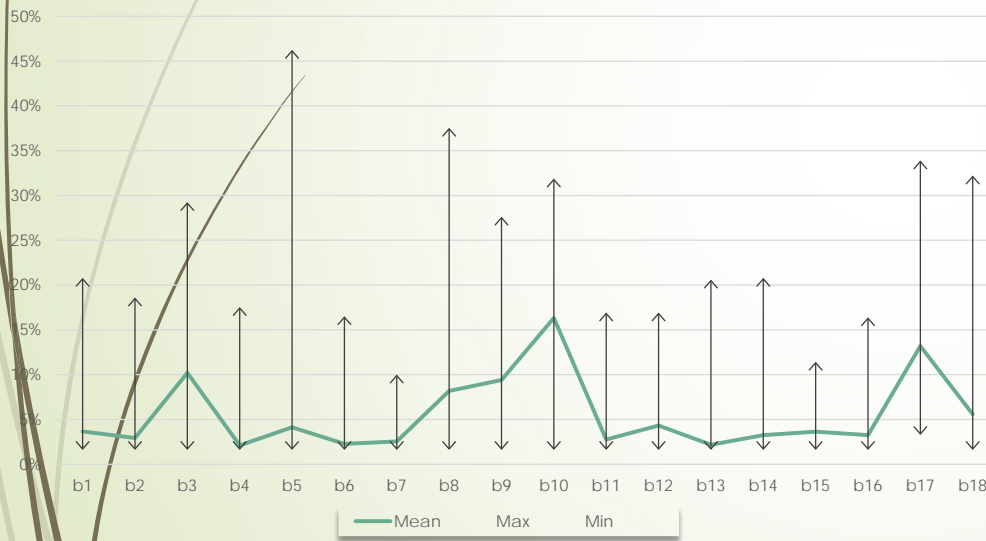
Criterion	Mean Weight	Standard Deviation	Min Weight	Max Weight
Wholesale and retail trade sector (g_{10})	16.3%	8.9%	1.6%	31.9%
Professional, scientific and technical activities sector - (g_{17})	13.2%	4.9%	3.3%	33.9%
Light Fuel Oil Price for households - (g_3)	10.2%	5.3%	1.6%	29.3%
Unemployment rate - (g_9)	9.4%	3.8%	1.6%	27.6%
Real estate activities - (g_8)	8.2%	9.4%	1.6%	37.6%
Public administration - (g_{18})	5.6%	5.2%	1.6%	32.2%

Conclusions

- The level of the national economic growth impose the greatest impact on electricity demand in Greece;

- Economic growth, energy prices and unemployment rate represent the main influential parameters of electricity demand evolution;

- Substantial more accurate forecasts are provided by the value-based forecasting model;

- Increased model stability is achieved via the value-based forecasting model with a total ASI equal to 81.1%;

- Constant increase of the electricity demand is expected during the upcoming years at the level of pre-crisis period (2008) by 2025.

THANK YOU!