Classification and Ranking of Greek agricultural and environmental e-governement services

Parthena Chatzinikolaou[1], Thomas Bournaris[1]

[1]Department of Agricultural Economics, Aristotle University of Thessaloniki, Greece,
e-mail: pchatzin@agro.auth.gr

Abstract. In recent years, the e-government revolution has induced transformational economic and social shifts around the world. The main objective of this paper is to analyze and rank the e-government agricultural services provided by the Greek government in Citizens Services Center web portal. For this reason an analysis of all the official e-government agricultural and environmental services was made. In order to characterize e-government evolution we use the four stage-model proposed by Layne and Lee (2001). The ranking of the environmental and natural resources subcategories was made with PROMETHEE II method in order to find which sector has proceeded in e-government evolution stages. The results show that there is a need to increase the interaction between citizens and different government by providing more integrated e-government services.

Keywords: agriculture, environment, e-government

1 Introduction

Information and communication technologies (ICTs) have dramatically changed the face of agriculture in developed countries. Many activities of farms have been linked to databases, electronic communication, portals and websites, giving the possibility to farmers for accessing government projects, financial institutions, markets, technical and scientific assistance (Andreopoulou, Koutroumanidis, & Manos, 2009). In many cases, access to public knowledge and information has become a key element of competitiveness in local, regional and international level. In economic terms, the information has become so important that it is considered as the fourth production factor. In short, the face of agriculture in the developed world has changed, and ICT has become increasingly critical for farmers and policy makers (AED, 2003).

On the other hand, rural areas are by definition distant, sparsely populated and are dependent on natural resources (Kilkenny, 1998). In Greece, people living in rural areas and especially farmers are far away from the decision and policy centers. So, it is not always possible for them (due to lack of transport, time or money and improper weather conditions) to travel to city centers in order to obtain the necessary information or to use the available government services for their agricultural holdings (Mahaman, Ntaliani, & Costopoulou, 2005). Greek agricultural public services are

In: M. Salampasis, A. Matopoulos (eds.): Proceedings of the International Conference on Information and Communication Technologies
for Sustainable Agri-production and Environment (HAICTA 2011), Skiathos, 8-11 September, 2011.

also characterized by slow computerization, with public services still being performed through the traditional way. Access to public knowledge and information is limited and does not cover all agricultural fields. Public web portals in many cases are not linked, have different navigation structure and only few are updated (Ntaliani, Costopoulou, & Karetsos, Mobile government: a challenge for agriculture, 2008). Particularly, e-government portals play an essential role, as are access points for citizens to local, regional or national electronic administration(Saprikis, Vlachopoulou, & Manthou, 2009). E-government refers to government's use of Information and Communication Technologies (ICTs), and particularly web portals to provide government information and services to citizens, businesses and government, in order to improve transparency, effectiveness and efficiency of public administration services(Ntaliani, Costopoulou, Karetsos, Tambouris, & Tarabanis, Agricultural e-government services: An implementation framework and case study, 2010).

The main objective of this paper is to analyze and rank the e-government agricultural and environmental services provided by the Greek government in Citizens Services Center web portal. The paper is organized as follows. In the following section, e-government types and stages are presented. In Section 3 the official greek e-governmente services are analysed and classified, followed by the reanking methodology in Section 4. Section 5 discusses the main results of the PROMETHEE II methodology. The final section concludes.

2 e-Government types and stages

In recent years, the e-government revolution has induced transformational economic and social shifts around the world. In order to proceed in designing and developing an e-government portal for agricultural services we have to define first what e-government is. For e-Government have been given many definitions, some of them are complex and others are simpler. One simple definition is given by the United Nations, which defines e-Government as "the use of ICT and its application by the government for the provision of information and public services to the people" (UN World, 2005). Another definition is given by the Organization for Economic Co-operation and Development (OECD) which defines e-Government as "the use of ICTs, and particularly the internet, as a tool to achieve better government" (OECD, 2003). In parallel, the European Union (The Commision of the European Communities, 2003) defines e-government as "the use of ICT *combined with* organizational change and new skills in order to improve public services, democratic processes and public policies". In a simple definition we can define the e-Government as "the provision of online public services and information, 24 hours a day and 7 days a week".

Many authors mentioned that the main goals of e-Government are to improve the efficiency of public administration and reduce administrative burdens for businesses and citizens. The types of e-government are established depending on the type of transactions that come in contact with the public administration. E-government includes electronic interactions of three types (Montagna, 2005):

a) Government-to-Citizen, (G2C),
b) Government-to-Business, (G2B) and
c) Government-to-Government (G2G)
Recently have been added and two more types (Devadoss, Pan, & Huan, 2002):
d) Government to Non-Governmental Organizations (G2NGO)
e) Government to Non-Profit Organizations (G2NPO)

In order to characterize e-government evolution we use the four stage-model proposed by Layne and Lee (2001). E-government services normally evolve through a four stage process (Layne & Lee, 2001). Stage 1 includes the initial web presence (publication of information on a web site), stage 2 includes limited interactions (online interactivity), stage 3 includes transactions (electronic delivery of documents) and stage 4 includes transformation (electronic delivery of services) (Gil-Garcia & Martinez-Moyano, 2007).

Adoption of e-government services has many potential benefits. First of all providing citizens with a greater range of services and delivery channels. One other point is that e-government is giving citizens greater access to the range of services by providing better, easier to use information on-line and joining up services at the point of delivery. It also gives services in a way which suits citizens' and businesses' needs by providing services on-line, 24 hours a day and providing faster and more accurate services. Finally, improves efficiency by replacing manual processing of routine high volume work by IT systems and it can also be used to make the purchasing of goods and services more efficient.

3 Greek Agricultural e-Gov Services

The aim of this paper is to find all the agricultural e-Gov Services provided by Greek Government to classify and rank them. For this reason, we analyzed the "Environment and Natural Resources" services of the website of KEP (www.kep.gov.gr), who has designed and developed electronic information covering the entire Public Sector, making an easier access for Internet transactions to the Public Administration. Additionally, it provides citizens and businesses alike, a central information and e-services hub for a series of administrative procedures, implementing a very significant step towards e-governance.

Table 1. Thematic Categories and services

A/A	Thematic Categories	Services	%
1	Labour, Insurance and Pension	733	33.7%
2	People, Communities and Living	185	8.5%
3	Entrepreneurship and Competitiveness	166	7.6%
4	Transportation, Travel and Tourism	156	7.2%
5	Environment and Natural Resources	155	7.1%
6	Economy and Finance	139	6.4%
7	Health and Social Care	129	5.9%
8	City planning and Land registry	116	5.3%
9	Education and Research	111	5.1%

10	Justice and Public Administration	109	5.0%
11	Public Order and Defence	92	4.2%
12	International and European Union Affairs	39	1.8%
13	Information and Communication	21	1.0%
14	Culture and Leisure	21	1.0%
	Total	2172	100.0%

All the services, available to users, are organized in basic thematic categories. In the next tables, a detailed description of what each thematic category contents is presented. Each thematic category includes specific services. Table 1 presents the distribution of the 2.172 services in the fourteen thematic categories. Each thematic category includes certain subcategories regarding the thematic issues, covered in each one. As we can see, Work, Insurance and Pension is the category that includes the most services (733) and covers 33.7%. The next category is People, Communities and Living which includes 185 services and covers the 8.5% of total services. Entrepreneurship and Competitiveness includes 166 services and covers 7.6%. Moreover, the category Transportation, Travel and Tourism includes 156 services (7.2%) and Environment and Natural Resources includes 155 services (7.1%). The next categories is Economy and Finance, which includes 139 services (6.4%), and Health and Social Care, which includes 129 services (5.9%). The next categories (City planning and Land registry, Education and Research, Justice, State and Public Administration) cover about 5.0% each one, and the category Public Order and Defence covers 4.2%. Finally, the last categories (International Affairs and the European Union, Information and Communication and Culture and Leisure) cover less than 2.0% respectively.

Table 2. Environment and Natural Resources

A/A	Subcategories	Services	%
1	Natural resources	98	61.3%
6	Flora and fauna	26	16.3%
2	Energy	14	8.8%
4	Environmental Protection	12	7.5%
3	Delineation	9	5.6%
5	Water resources	1	0.6%
	Total	160	100.0%

Table 2 focuses on identifying the category “Environment and Natural Resources” structure and the number of services included in each one. As mentioned above, each thematic category includes certain subcategories. The subcategories included in this thematic category are: Utilization of natural resources, Flora and fauna, Energy, Environmental Protection, Delineation and Water resources.

The first subcategory is Utilization of Natural resources (Table 3). This category includes services that regard Fisheries (26.7% of total services), Agriculture (27.6%), Forestry, Livestock (22.9%), Quarries (9.5%), Beekeeping (1.9%), Mines, Quarries, Poultry (6.7%) and finally Logging (4.8%).

Table 3. Natural Resources

A/A	Subcategories	Services	%
1	Fisheries	28	26.7%
2	Agriculture	29	27.6%
3	Forestry	0	0.0%
4	Livestock	24	22.9%
5	Quarries	10	9.5%
6	Beekeeping	2	1.9%
7	Mines	0	0.0%
8	Poultry	7	6.7%
9	Logging	5	4.8%
	Total	105	100.0%

Table 4. Flora and fauna

A/A	Subcategories	Services	%
1	Forests	16	61.5%
2	Animals	8	30.8%
3	Plants	2	7.7%
	Total	26	100.0%

On the issue of Flora and Fauna there are 26 services. More than the half of them (61.5%) regards forests, while 31% regard animals and 7.7% plants (Table 4). Moreover, for the Subcategory of Energy, it includes services about renewable energies, electricity and fuels (Table 5). The most services in this subcategory (78.6%) are about fuels, and the rest 21.4% regard electricity.

Table 5. Energy

A/A	Subcategories	Services	%
1	Renewable sources of Energy	0	0.0%
2	Electricity	3	21.4%
3	Fuels	11	78.6%
	Total	14	100.0%

Table 6. Environmental Protection

A/A	Subcategories	Services	%
1	Ban Hunting	0	0.0%
2	Waste Management	8	61.5%
3	Environmental Protection	4	30.8%
4	Pollution	1	7.7%
	Total	13	100.0%

Similarly, in the next subcategory about Environmental Protection, there are 13 ban hunting, waste management, environmental protection generally and pollution (Table 6). 61.5% of total services regard waste management, 30.8% of them regard environmental protection generally, and 7.7% pollution.

Additionally, the services regarding delineation refer to sea shore, streams and ditches (Table 7). Most of the services (72.7%) refer to sea shore, while the rest of them are equally distributed in streams and ditches.

Finally, in the last subcategory, Water resources, there are services referring to irrigation, lakes, rivers and groundwater (Table 8).

Table 7. Delineation

A/A	Subcategories	Services	%
1	Sea shore	8	72.7%
2	Streams	2	18.2%
3	Ditches	1	9.1%
	Total	11	100.0%

Table 8. Water resources

A/A	Subcategories	Services	%
1	Irrigation	0	0.0%
2	Lakes	0	0.0%
3	Rivers	0	0.0%
4	Groundwater	0	0.0%
	Total	0	0.0%

4 Ranking Methodology

The method that was used for the ranking of the six subcategories of the "Environment and Natural Resources" main category was the multicriteria analysis PROMETHEE II, which applied a linear form of function in this particular case, using selected criteria. A considerable number of successful applications has been treated by the PROMETHEE methodology in various fields such as Banking, Industrial Location, Manpower planning, Water resources, Investments, Medicine, Chemistry, Health care, Tourism, Ethics in OR, Dynamic management, (Albadvi, Formulating national information technology strategies: A preference ranking model usin PROMETHEE method, 2004; Albadvi, Chaharsooghi, & Esfahanipour, Decision making in stock trading: An application of PROMETHEE, 2007; Amador, Sumpsi, & Romero, 1998)(Andreopoulou, Tsekouropoulos, Koutroumanidis, Vlachopoulou, & Manos, 2008)(Andreopoulou, Koutroumanidis, & Manos, The adoption of e-commerce for wood enterprises, 2009)(Koutroumanidis, Papathanasiou, & Manos, 2002)(Olson, 2001)(Siskos & Grigoroudis, 2002)

The success of the methodology is basically due to its mathematical properties and to its particular friendliness of use.

The PROMETHEE II method (preference ranking organization method for enrichment evaluation) is a multicriteria decision-making method developed by (Brans & Vinke, A preference ranking organization method: The PROMETHEE method for multiple criteria decision making, 1985). It is well adapted to problems

where a finite number of alternatives are to be ranked considering several, sometimes conflicting criteria. (Brans, Vincke, & Mareschal, How to select and how to rank projects: The PROMETHEE method, 1986) considered the following multicriteria problem:

$$Max\{f_1(a), \dots f_k(a), \backslash\ a \in K\}, \quad (1)$$

where K is a finite set of actions and $f_i, i = 1, \dots k$, are k criteria to be maximized.

The PROMETHEE methods include two phases (Roy, 1968) (Roy, 1996):

- the construction of an outranking relation on K,
- the exploitation of this relation in order to give an answer to (1).

In the first phase, a valued outranking relation based on a generalization of the notion of criterion is considered: a preference index is defined and a valued outranking graph, representing the preferences of the decision maker, is obtained (Roy, The outranking approach and the foundations of ELECTRE methods., 1991). The exploitation of the outranking relation is realized by considering for each action a positive and a negative flow in the valued outranking graph: a partial preorder (PROMETHEE I) or a complete preorder (PROMETHEE II) on the set of possible actions can be proposed to the decision maker in order to achieve the decision problem. Only a few parameters are to be fixed in these methods and they all have an economic signification so that the decision maker is able to determine their values easily. Furthermore, some small deviations in the determination of these values do not often induce important modifications of the obtained rankings.

The preference structure of PROMETHEE is based on pair wise comparisons. In this case the deviation between the evaluations of two alternatives on a particular criterion is considered. The preference index for each pair of alternatives $a, b \in K$, ranges between 0 and 1. The higher it is (closer to 1) the higher the strength of the preference for a over b is.

$H(d)$ is an increasing function of the difference d between the performances of alternatives a and b on each criterion. $H(d)$ is a type of preference intensity (Vincke, 1992). This function is represented by figure 1.

$$H(d) = \begin{cases} P(a,b), & d \geq 0, \\ P(b,a), & d \leq 0. \end{cases} \quad (2)$$

The $H(d)$ function can be of various different forms, depending upon the judgment policy of the decision maker (Kalogeras, Baourakis, Zopounidis, & Dijk, 2005). Generally, six forms of the $H(d)$ function are commonly used (Brans, Macharis, Kunsch, Chevalier, & Schwaninger, 1998) suppose that the decision maker has specified a preference function P, and weight π_i for each criterion $f, (i = 1 \dots . k)$ of problem (6). The weight π_i is a measure of the relative importance of criterion f_i if all the criteria have the same importance for the decision maker, all weights can be taken equal.

The multicriteria preference index Π is then defined as the weighted average of the preference functions P_i:

$$\Pi(a,b) = \frac{\sum_{i=1}^{k} \pi_i P_i(a,b)}{\sum_{i=1}^{k} \pi_i} \quad (3)$$

$\Pi(a,b)$ represents the intensity of preference of the decision maker of action a over action b, when considering simultaneously all the criteria. It is a figure between 0 and 1 and:

- $\Pi(a,b) = 0$ denotes a weak preference of a over b for all the criteria,
- $\Pi(a,b) = 1$ denotes a strong preference of a over b for all the criteria.

This preference index determines a valued outranking relation on the set K of actions. This relation can be represented as a valued outranking graph, the nodes of which are the actions of K. When each alternative is facing other alternatives in K, the following outranking flows are defined:

The positive outranking flow:

$$\varphi^+(a) = \sum_{b \in k} \Pi(a,b) \quad (4)$$

The positive outranking flow expresses how an alternative is outranking all the others. It is its power, its outranking character. The higher the $\varphi^+(a)$, the better the alternative.

The negative outranking flow:

$$\varphi^-(a) = \sum_{b \in k} \Pi(b,a) \quad (5)$$

The negative outranking flow expresses how an alternative is outranked by all the others. It is its weakness, its outranked character. The lower the $\varphi^-(a)$, the better the alternative.

The net outranking flow can is the balance between the positive and the negative outranking flows. The higher the net flow, the better the alternative:

$$\varphi(a) = \varphi^+(a) - \varphi^-(a) \quad (6)$$

4.1 Application of the methodology

The next stage is the ranking of the six Environment and Natural Resources subategories with the implementation of the multicriteria method of PROMETHEE II, according to specific criteria. The criteria we have chosen are the number of the services included in each category and the number of the services included in each stage (publication of information on a web site, online interactivity, electronic delivery of documents and electronic delivery of services). The next table (table 9) presents the rates of the services of each category, included in the four different stages.

Table 9. Rates of environment and natural resources e-gov services distribution in the four e-gov stages

A/A	Thematic Categories	Stages			
		1st	2nd	3rd	4th
1	Utilization of natural resources	21.43%	73.47%	2.04%	3.06%
2	Energy	28.57%	64.29%	7.14%	0.00%
3	Delineation	88.89%	11.11%	0.00%	0.00%
4	Environmental Protection	58.33%	41.67%	0.00%	0.00%
5	Water resources	100.00%	0.00%	0.00%	0.00%
6	Flora and fauna	19.23%	69.23%	11.54%	0.00%

The multi-criteria method PROMETHE II was applied as a part of the theory of relevance superiority. The shape of the $H(d)$ function selected is the Gaussian form (Gaussian criterion) defined as follows:

$$H(d) = 1 - exp\{-d^2/2\sigma^2\} \quad (7)$$

where d is the difference among the categories a and b $[d = f(a) = f(b)]$ and σ is the standard deviation of all differences d and for each criterion.

The multicriteria indicator of preference $\Pi(a, b)$ which is a weighted mean, of the preference functions $P(a, b)$with weights π_i for each criterion, express the superiority of the category a against category b after all the criteria tested.

We received 50 scenarios of weights and on each scenario of weights we receive 10 scenarios on the standard deviation of σ distribution of Gauss. The 10 scenarios σ oscillate from $0.25s$ until $2.5s$ with step $0.25s$, where s the standard deviation of all differences d for the each criterion. Globally we take 500 prices for each net flow per category and find the medium price (Koutroumanidis, Nicola Giata, Papathanasiou, & Manos, 2002).

When two categories (a, b) are compared to each other one is assigned two values of flows: the positive and the negative outranking flow. The positive flow expresses the total superiority of the category a against all the other categories for all the criterions. The negative flow expresses the total superiority of all the other categories against category a for all the criterions.

The net flow is the number that is used for the comparison between the categories in order to obtain the final ranking. $\Phi(x)$ is the net flow of each category. Thus is created the table of net flows of the six categories according to that becomes the ranking of them. The net flows are presented in table 10 and the ranking of the six categories as obtained from the net flows, is presented in table 11.

The category ranked in first place is Utilization of Natural Resources. According to the results of the analysis we observe that Flora - fauna and Energy have also positive net flows and possess the second and third place, respectively. The next positions in the ranking belong to Delineation and Environmental Protection with small negative net flows around 0. At the lowest position we find the Water Resources with negative net flows.

Table 10. Net flows of the 6 Categories

	Services	Net flows
X1	Utilization of natural resources	Φ1
X2	Energy	Φ2
X3	Delineitation	Φ3
X4	Environmental Protection	Φ4
X5	Water resources	Φ5
X6	Flora and fauna	Φ6

Table 11. Ranking of the 6 Services

Ranking	Services		Net Flow
1	Utilization of natural resources	Φ1	0.777761
2	Flora and fauna	Φ6	0.556467

3	Energy	Φ2	0.120247
4	Delineation	Φ3	-0.24157
5	Environmental Protection	Φ4	-0.30767
6	Water resources	Φ5	-0.90523

5 Conclusions

The aim of this paper is to analyze and rank the agricultural and environmental e-gov services provided officially by the Greek government portal KEP (www.kep.gov.gr). For this reason an analysis of all the e-government agricultural services was made. The classification results show that the agricultural and environmental e-government services are in the fifth place of the main categories provided by the Greek government. Specifically, agricultural, livestock and fisheries e-gov services are the main subcategories of the natural resources and the services provided are well organized.

On the other hand, the distribution of these services in the four e-government evolution stages shows that the majority belongs to the initial stages of the simple web presence and interaction. Greek government web services normally offer static information about agencies and government organizations.

The ranking of the environmental and natural resources subcategories was made in order to find which sector has proceeded in e-government evolution stages. The criteria chosen was the number of the services included in each category and the number of the services included in each e-government stage. The results show that utilization of natural resources which includes e-government services for agriculture, livestock and fisheries was ranked in the first place. The results also show that there is a need to increase the interaction between citizens and different government by providing more integrated e-government services. Therefore, Greek government needs to cross organizational boundaries and develop a comprehensive and integral vision of the government as a whole.

References

1. AED. (2003). Future Directions in Agriculture and Information and Communication Technologies (ICTs) at USAID.
2. Albadvi, A. (2004). Formulating national information technology strategies: A preference ranking model usin PROMETHEE method. *European Journal of Operational Research , 153*, 290-296.
3. Albadvi, A., Chaharsooghi, S., & Esfahanipour, A. (2007). Decision making in stock trading: An application of PROMETHEE. *European Journal of European Research , 177*, 673-683.
4. Amador, F., Sumpsi, M. J., & Romero, C. (1998). A non-interactive methodology to assess farmers' utility functions: an application to large farms in Andalusia, Spain. *European Review of Agricultural Economics , 25*, 92-109.

5. Andreopoulou, Z. S., Koutroumanidis, T., & Manos, B. (2009). The adoption of e-commerce for wood enterprises. *Int. J. Business Information Systems , 4* (4), 440-459.
6. Andreopoulou, Z., Koutroumanidis, T., & Manos, B. (2009). The adoption of e-commerce for wood enterprises. *International Journal of Business Information Systems , 4* (4), 440-459.
7. Andreopoulou, Z., Tsekouropoulos, G., Koutroumanidis, T., Vlachopoulou, M., & Manos, B. (2008). Typology for e-business activities in the agricultural sector. *IJBIS, International Journal of Business Information Systems , 3* (3), 231-251.
8. Brans, J. P., & Vinke, P. (1985). A preference ranking organization method: The PROMETHEE method for multiple criteria decision making. *Management Science , 31* (6), 647–656.
9. Brans, J. P., Vincke, P., & Mareschal, B. (1986). How to select and how to rank projects: The PROMETHEE method. *European Journal of Operational Research , 24*, 228-238.
10. Brans, J., Macharis, C., Kunsch, P., Chevalier, A., & Schwaninger, M. (1998). Combining multicriteria decision aid and system dynamics for the control of socio-economic processes. An iterative real-time procedure. *European Journal of Operational Research , 109* (2), 428-441.
11. Devadoss, P., Pan, S., & Huan, J. (2002). Structurational analysis of e-Government initiatives: a case study of SCO. *Decision Support Systems , 34*, 253-269.
12. Gil-Garcia, R. J., & Martinez-Moyano, I. J. (2007). Understanding the evolution of e-government: The influence of systems of rules on public sector dynamics. *Government Information Quarterly , 54*, 266-290.
13. Kalogeras, N., Baourakis, G., Zopounidis, C., & Dijk, G. v. (2005). Evaluating the financial performance of agri-food firms : a multicriteria decision-aid approach. *Journal of Food Engineering , 70* (3), 365-371.
14. Kilkenny, M. (1998). Transport Costs and Rural Development. *Journal of Regional Science , 38* (2), 293-312.
15. Koutroumanidis, T., Nicola Giata, M., Papathanasiou, J., & Manos, B. (2002). Multi criteria analysis of efficiency of agricultural sector in Balkan countries. *6th Balkan Conference on Operational Research 22-25 May.* Thessaloniki.
16. Koutroumanidis, T., Papathanasiou, J., & Manos, B. (2002). A Multicriteria analysis of productivity of agricultural regions of Greece. *Operational Research. An International Journal , 2* (3), 339-346.
17. Layne, K., & Lee, J. (2001). Developing Fully Functional E-government: A Four Stage Model. *Government Information Quarterly , 18*, 122-136.
18. Mahaman, B. D., Ntaliani, M. S., & Costopoulou, C. I. (2005). E-Gov for Rural Development: Current Trends and Opportunities for Agriculture. *Proceedings of the 2005 EFITA/WCCA Joint Congress on "T in Agriculture"*. Vila Real, Portugal, July 25-28,.
19. Montagna, J. M. (2005). A framework for the assessment and analysis of electronic government proposals. *Electronic Commerce Reseach and Applicaions , 4* (3), 204-219.

20. Ntaliani, M., Costopoulou, C., & Karetsos, S. (2008). Mobile government: a challenge for agriculture. *Government Information Quarterly , 25* (4), 699-716.
21. Ntaliani, M., Costopoulou, C., Karetsos, S., Tambouris, E., & Tarabanis, K. (2010). Agricultural e-government services: An implementation framework and case study. *Computers and Electronics in Agriculture , 70*, 337-347.
22. OECD. (2003). *The e-Government Imperative.* OECD.
23. Olson, D. (2001). Comparison of three multicriteria methods to predict known outcomes. *European Journal of Operational Research , 130*, 576-587.
24. Roy, B. (1968). Classement et choix en presence de points de vue multiple, (La methode ELECTRE). *RIRO* , 55-57.
25. Roy, B. (1996). *Multicriteria Methodology for Decision Aiding.* Dordrecht: Kluwer.
26. Roy, B. (1991). The outranking approach and the foundations of ELECTRE methods. *Theory and Decision , 31*, 49–73.
27. Saprikis, V., Vlachopoulou, M., & Manthou, V. (2009). A typology framework of Greek business-to-business electronic marketplaces. *International Journal of Business Innovation and Research , 3* (3), 252-267.
28. Siskos, Y., & Grigoroudis, E. (2002). Measurement Customer satisfaction for various services using multicriteria analysis. In *Aiding decisions with multiple criteria* (pp. 457-482). Kluwer Academic Publishers.
29. The Commision of the European Communities. (2003). The Role of e-Goverment for Europe's Future. Brussels, 26/9/2003.
30. UN World. (2005). e-Government Readiness Report 2005: From E-government to E-Inclusion.
31. Vincke, P. (1992). *Multicriteria Decision Aid.* New York: John Wiley & Sons Ltd.