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E-Democracy and Knowledge: A Multicriteria Framework for the New Democratic Era

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Founded in 1963 by two prominent Austrians living in exile – the sociologist Paul F. Lazarsfeld and the economist Oskar Morgenstern – with the financial support from the Ford Foundation, the Austrian Federal Ministry of Education and the City of Vienna, the Institute for Advanced Studies (IHS) is the first institution for postgraduate education and research in economics and the social sciences in Austria. The **Economics Series** presents research done at the Department of Economics and Finance and aims to share “work in progress” in a timely way before formal publication. As usual, authors bear full responsibility for the content of their contributions.

Das Institut für Höhere Studien (IHS) wurde im Jahr 1963 von zwei prominenten Exilösterreichern – dem Soziologen Paul F. Lazarsfeld und dem Ökonomen Oskar Morgenstern – mit Hilfe der Ford-Stiftung, des Österreichischen Bundesministeriums für Unterricht und der Stadt Wien gegründet und ist somit die erste nachuniversitäre Lehr- und Forschungsstätte für die Sozial- und Wirtschaftswissenschaften in Österreich. Die **Reihe Ökonomie** bietet Einblick in die Forschungsarbeit der Abteilung für Ökonomie und Finanzwirtschaft und verfolgt das Ziel, abteilungsinterne Diskussionsbeiträge einer breiteren fachinternen Öffentlichkeit zugänglich zu machen. Die inhaltliche Verantwortung für die veröffentlichten Beiträge liegt bei den Autoren und Autorinnen.

Abstract

This paper analyses a new framework for decision-making in e-democracies that exploits the power of Internet based public knowledge, which is called briefly *e-cognocracy*. This is not a procedure to improve technical aspects using the Internet (e.g. e-voting); it is rather a procedure to add a new quality to the democratic system by using the network. This proposed system of e-cognocracy would allow those who are interested to solve highly complex problems by participatory decision-making. Furthermore, we suggest the multicriteria framework for the modelling and resolution of such complex problems. Similarly, using the analytic hierarchy process (AHP) approach, we propose decisional (*analytic* and *informatic*) tools for searching the knowledge - relevant for the decision-making process. This knowledge of patterns of behaviour, trends, opportunities, decisions and stylised facts will be the starting point of a consensus-reaching process, which is aimed to effectively solve problems of high complexity of the Internet society.

Keywords

E-democracy, knowledge society, e-cognocracy, multicriteria, AHP criterion, consensus

JEL Classification

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Comment

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1. INTRODUCTION

Motto: *There is no democracy without freedom;
There is no freedom without knowledge.*

During the last few years we have witnessed a social transformation that has come about as the result of the development of the new technologies. The importance and influence of the web in the behaviour of individuals and organisations alike continues to increase, in such a way that today it is impossible to imagine any business or, indeed, social organisation, that is not managed to a greater or lesser extent by way of the web.

This change of paradigm, motivated by the evolution in information and communication technologies (ICT) is being introduced at great speed in all the spheres of social action. During the last decade, and essentially as a result of the political guidelines such as those reflected in the EU's Sixth Framework Program, these new technologies are being incorporated into public administration, politics and, more particularly, into the governance of the citizenry (priority lines 1.1.2 *Information Society Technologies* and 1.1.7 *Citizens and Governance*).

Obviously, the use of the new technologies in the governance of the citizens (*e-governance*) could be limited, as is the case in other areas of business activity, to mere technical assistance in the achievement of certain objectives, in this case to facilitate the election of the democratic representatives of individuals (*e-voting*). However, in the context of the so-called Knowledge Economy, in which knowledge is the true product derived from any productive process, and not a sub-product of the same as it has come to be considered in Industrial Economy, the new technologies that are at the service of democracy, particularly the web, cannot and must not be limited to this simple instrumental role.

When speaking of Electronic Democracy, the central mission of the web should be favouring the creation and diffusion of knowledge through discussion and the inclusion of citizens in the public decision-making process. The search for knowledge as a social strategy is in agreement not only with the proposals of leading scientific philosophers such as Diderot¹ and Habermas² but also with more recent evolutionist proposals (Moreno, 2003).

Taking advantage of the democratic system as a vehicle of social involvement and of the web as a vehicle of communication, we present a new democratic system in the following that allows us to remedy some of the limitations of the traditional democratic system and to encourage the cognitive or fundamental process of living systems (Capra, 1996) - a process that characterises the existence and perpetuation of the species, particularly of the human being. True electronic democracy consists of involving³ citizens (something that goes beyond mere participation and discussion) in the generation and diffusion of knowledge.

The rest of the paper is organised as follows. After this brief introduction, we reflect on a number of the more debatable aspects of traditional democracy and consider various instrumental possibilities that the new technologies make available to the service of democracy in Section 2. In Section 3 we offer a new proposal for a democratic system based on knowledge. In Section 4 we pose the need for multicriteria decision techniques

¹ The search for knowledge is the route to satisfaction.

² Science and democracy share one style of thinking.

³ The idea of direct involvement or implication is used indistinctly in this paper.

as tools that can assist in the public decision making process by way of the web: Furthermore, we present several decisional tools that can be used in the line with the AHP procedure. Finally, Section 5 closes the paper with a review of the main conclusions.

2. ELECTRONIC DEMOCRACY

2.1. Traditional Democracy

Democracy is understood as the political system in which the people exercise their sovereignty through their intervention in government and with the aim of improving their own conditions. Under this political system, and by way of universal suffrage, the people nowadays have the right to elect and control their governments on a periodical basis.

In its origins, democracy was more of a political concept defended by one camp (the democratic camp arose in opposition to the aristocratic) than a determined type of social organisation. Thus, in ancient Greece the direct participation of everyone in the Popular Assembly was encouraged by the limited size of the population and by the fact that initially only those who qualified as citizens took part in the decision process.

The traditional democratic system, as a political regime directed towards organising the governance of society, exhibits some limitation or critical points, from amongst which the following stand out:

- The participation of the citizens is limited in the majority of cases to the moment of actually electing the representatives on Election Day. Even then, in the absence of open lists, this process is often restricted to the choice of a specific political party. As such, it is a single act and not, as should be expected in self-organised dynamic systems, a continuous process of participation and improvement.
- The static voting procedure implies a low level of internal democracy as only a very limited number of a political party's members actually controls the nomination of the electoral lists. Such a process might be time efficient, but is unlikely to reflect the opinion of the voters adequately. The free choice of the citizens is distorted, because there is an a priori filtering of the candidates by party representatives. In such circumstances, the voting is limited to a *pro-rata* exercise between the candidates fixed by the party "functionaries".
- The current democratic system gives no consideration to those individuals who do not vote, whilst those that deposit a blank ballot paper, usually as a protest against the system, are viewed as part of that system. Indeed, these votes are taken into account to reinforce the role of the majority groups. The system tries to perpetuate itself over time, establishing barriers to entry⁴ (minority groups) and carrying out a feed-back exercise with the creation or generation of new "figures" or political leaders and their legitimation.
- Political parties can abuse the confidence placed in them by their voters. After Election Day, parties can pursue objectives that are not declared in their electoral manifestos. These are hidden interests that sometimes govern the behaviour of these parties, or at least of some of their members. In certain extreme situations,

⁴ When speaking of the generation of knowledge it is a mistake to forget the minority groups, given that the "discovery" of truth and knowledge is usually a specific act, carried out by an individual and not by a group.

it could even be a minority group, whose goals are clearly in conflict with those of the majority of the party representatives (or deputies in the chamber), who actually decides on sensitive questions.

- In the present election system, control over the activities of politicians is limited to no more than casting a vote at the time of the next election. This is clearly insufficient, given that today we are immersed in a global society that requires immediate interventions and in which the preference structure of individuals is continuously evolving (the dynamic character of preferences). However, as things stand, control over the system is exercised at instances that are regularly spaced over time.
- There is a *social opportunity cost* from not using one of the most recognised and broadly supported systems of political participation, that is to say, democracy. The new possibilities of e-democracy can be used for more ambitious objectives than simply electing representatives which, in the majority of cases, are already filtered by the parties. Thus, most present static democratic systems are not encouraging democratic values of a global ambit, such as discussion, dialogue, the search for and dissemination of knowledge, the strengthening of ethical and moral values, or learning and education.

During the last few years, we have witnessed a true social revolution, motivated essentially by two closely related aspects: first, the technological change that has taken place with the arrival of the Internet and the web; second, the change in society's values, driven by the emergence of concern for ecology, sustainable development, a holistic view of reality, solidarity, ethical values, etc.

Technological development has been incorporating itself in all these social ambits. In the particular case of democracy, there have been a number of proposals aimed at using the web to facilitate the election process of democratic representatives (*e-voting*). In this case, aspects relating to security and confidence in the communication and treatment of information are essential in order for the system to have any credibility. To encourage such a social perception, it would be highly appropriate if the web allowed individuals to verify the trace left by the voting process. In this regard, it would be sufficient if the citizen could confirm that the vote cast indeed corresponded to the option chosen.

Furthermore, the web could play an important role with respect to the transparency of democratic processes. It improves political communications and the accessibility of citizens to their representatives and political groups. It also enables the voter to check and learn about the agenda of the parliamentary sessions regularly and "on-line". Similarly, the interested voter can be aware of the meetings that have been fixed in the representative bodies. Parties in the electronic era will have to adapt to their new roles: the operational structures of the political parties would have to set up on-line information and communication between citizens and their political representatives.

2.2. Stages in the evolution of Democracy. E-democracy

Digital or electronic democracy (e-democracy) stands at the end of a long historical process, which developed in three stages. The starting point was the Athenian agora democracy, then direct democracy came as a second stage and now we are in the midst of a discussion on deliberative democracy.

The Athenian agora democracy has been an ideal for all democratic proposals and constitutions in the subsequent centuries. As the name agora indicates, the system relies on the fact that the number of voters in such city-states can assemble in one place and the vote – according to the principle one man one vote - can be counted immediately.

Most of the democratic constitutions have replaced this agora system by an assembly of representatives. Thus, the people could not vote directly, but the representatives of the people who had to be elected (democratically and proportionally) on Election Day and the number of representatives were determined proportional to the population in the regions in one nation. The sovereign for legislation was not the people, but a representative body like the parliament. Rousseau criticized this as “representation undermines the sovereign”.

Thus, the demand for more democracy led to the system of *direct democracy*. A good example for the implementation of direct democracy is Switzerland with 23 cantons and 3 half cantons. Each (half-) canton is its own sovereign and the voters regularly meet in a central place. In old times the majority for a proposal was found by counting all raised hands. This system was subsequently changed into a voting system with ballots, since the number of people grew considerably in the 19th century, especially in cities (in rural areas the local voting by Sunday assemblies lasted until the 1990ies.).

Two types of voting that can be found for direct democracies are: referenda, and legal and constitutional initiatives. In practice, legal and constitutional initiatives dominate the political process. Referenda could be compulsory (for important issues) or facultative, i.e. if a certain group wants to place a law for a referendum, when a new law was passed in parliament and has to be agreed to by the public. The procedure was refined in the 1960s by a second “federal-friendly” counting rule. A referendum does not only need the majority of the popular vote, but also the majority of the 23 cantons. This is called qualified majority and the new European Constitution (the 2003 proposal) has adopted a similar clause for EU decisions: Next to the majority in the EU council, the states who are in favor of a proposal need also to represent 60% of the population in the EU.

But the development of more democracy led to the demand of more direct participation or *deliberative democracy* as political scientists recently call it. Participative democracy could be found in many western democracies after the 2nd World War. “Democratization of all areas of the society” was the demand of many European democratic parties in the 1960s (and after the student protest in 1968) and many public institutions were reformed towards democratic principles (e.g. school and university laws in Western Europe, or the law for labor and work council representatives in the board of European companies).

B. Barber (1986) formulated this as a demand for “strong democracy” or the transition from a passive voting system to an active – participative – voting system. This presupposes a strong commitment of the average citizen for issues of public welfare. Next to public discussion of society-relevant problems the voter has to be educated, and has to learn the discourse on political issues and consensus finding. Even if citizens cannot participate in all public discussions, these new social processes create an atmosphere of new public and social responsibilities.

The goal of *deliberative democracy* is even more demanding: Next to the wish of participation, the citizen is required to actively discuss the problem and to accept a consensus. Also he has to accept the way how this unique (or univocal) decision was

obtained. Often political scientists demand that the principles on public discourses proposed by Habermas (1986) are applied to deliberative participation:

- All citizens have the same chance to participate in the public exchange of information (nobody can be excluded);
- The choice of topics is open for everybody and the discussion can be interrupted and picked up at a later point in time;
- The debate is free of outside pressure or any other influences and allows the interaction with all citizens;
- Dryzek (2000) defined deliberative discourses as “Dispassionate, reasoned and logical communications”.

E-democracy is regarded to consist of two basic processes. The first step is the deliberative phase consisting of on-line debates, understanding of positions and arguments and information exchange. The second step consists of the e-voting procedure (which is discussed in the next section). Clearly in terms of electronic communication, these two steps have to meet new technical and safety standards, a topic that is mainly under current development in computer science.

The deliberation process creates a new quality for a modern e-democracy (Winkler, 2003) and addresses the following points:

- a) Deliberation brings a new legitimization and basis for political decision making;
- b) It enforces the trust of the citizens into democratic institutions and their representatives;
- c) Deliberation improves the informational basis of all citizens and voters;
- d) The deliberation processes have integrative power and are found to be “community building” (this is an important aspect if e-democracy is extended from a regional to a European level);
- e) Deliberation processes can be used to create a (common) public opinion.

Obviously, the use of the web as a support for the election process and as a guarantee of the transparency and accessibility of the democratic system, two of the characteristics that are demanded by the new scientific methods (Roy, 1993), has a number of specific technical, economic and social limitations. What are these?

From a *technical* point of view, e-voting and the desiderata transparency and accessibility impose a number of minimum requirements associated with the capacity of communication and implantation on the web and with respect to all security-related questions. From an *economic* point of view, what is required is the incorporation of appropriate and efficient mechanical tools, and these imply significant economic expenditures. Finally, from the *social* point of view, the use of the new technologies often provokes a degree of reticence amongst certain social collectives, particularly the elderly, which would require the establishment of different training programs aimed at including all citizens in the knowledge society.

Indeed, it could well be that politicians themselves are not interested in incorporating the new technologies into the public participation systems, given that the essence of the Internet, that is to say, the sharing of information, is not favourably viewed by many of them.

Quite apart from the use of the new technologies as an automation tool of the democratic system, what has been given the name Electronic Democracy sets out to encourage debate and reflection on the role of the ICT in democratic innovation (see Section 3). A second objective is the strengthening of democratic principles, which we will see in more detail in the next subsection (for details see also <http://www.democraciaweb.org/demo1cas.htm>).

2.3. E-democracy, secret voting and democratic principles

In this section, following Uhrmann (2002), we give a short introduction of the history of secret voting that might help to rethink current objections to e-voting as being not in line with democratic traditions. Secret public voting is a recent contribution in the history of voting in Europe. The institution of secret voting has been the privilege of aristocratic societies for a long time, whereas public voting was regarded as a characteristic of the “general public”. Athens with the agora system voted in public, except for jurisdiction. In Roman times aristocracy voting took place first in public and later in a secret way.

Since the 13th century, voting in England followed the Germanic principle "viva voce", i.e. voting by shouting in an assembly. Secret voting was the exception, in all types of council votings. England has gone all the way for public votings up to parliament.

The Italian city republics developed a different type of voting system. Consuls, Doges and public servants were elected by different voting systems and by different procedures, some including secret voting. Venice was said to have invented a secret voting scheme in the year 1268. The voting process was based on coloured balls, beans, etc. which were dropped into an urn. This system was called Ballotte (after the used ball), and the principle of voting secrecy was strongly protected. The voting for the Doges in Venice followed a complicated 10-step procedure. Surprisingly for some people, the favourites could mostly win.

In the course of the 19th century the voting process switched from public to secret. In Prussia this change happened as late as in 1918. The critical issue was that many believed that secret or anonymous votes given on paper were easy to manipulate or could be changed since paper votes could not be traced back on principle.

From a historical perspective it is interesting that the introduction of secret voting did not lead to a higher participation rate as the following quote by Teuber (1980) shows:

“In the 19th century before the secret ballot was introduced, Election Day itself was a festive, noisy, fiercely, partisan, disruptive and – like celebrations- extremely well attended. ...In the 1890’s, voter turnout in America began to drop dramatically with the advent of the secret ballot. ... One [explanation] ... is that voting is no longer a public occasion but has become a ‘lonely decision’ ”

This shows that secret voting changed in the course of history according to technical and political views and is in accordance with the prevailing voting system.

Most western democracies follow the principles of a general, free, equal, secret, personal and direct election system. These principles are now evaluated in the light of a future e-voting system.

A *general election* means that no regular citizen can be excluded from voting, as long as he or she meets all conditions for the registration into a voting list. This implies that when an e-voting system is installed, nobody can be excluded from his right to vote.

Unless everyone has access to an e-voting facility all facilities of the traditional voting system have to be offered in the usual way, e.g. reasonable travel distances must be guaranteed.

This does not necessarily mean that voting by cross making on paper has to be continued. A possibility is that the e-voting program is installed in a traditional election kiosk as a voting machine (by computers and terminals) and a joint system for vote counting can be used. But also other possibilities of co-existence of digital and non-digital voting system might be possible.

The *principle of equal voting* is fulfilled if all the voters have equal weights. Similarly, any misuse of votes by e-voting or in the traditional way has to be suppressed. This challenges the supervision system of any public election and means the enforcement of strict rules for the voting procedure.

The *principle of personal voting* means that each voter drops his vote into the urn in the presence of witnesses: the witnesses make sure that no other person or forces prevent the voter to exercise his personal voting right. Any deviation from this rule would make the vote illegal. In case of e-voting, the election supervisor must have the right and the technical possibilities to find out if any particular vote came from the person who had the legal right to vote. One way to realize such a system is to implement a public system of electronic signatures combined with the physical identification of the voter (fingerprint, iris, body temperature, smell...).

The *principle of direct voting* means that (indirect) voting by an electoral body (as e.g. for the US president) is not allowed.

In general, the personal and direct voting principle is a challenge to the security system of Internet based transactions. Such safety standards might be also important for commercial transactions like Internet banking or e-commerce. More new developments can be expected and they might also be used for guaranteeing voting safety.

The *principle of free voting* means that nobody can be forced to vote for a certain party, a certain person or a certain voting alternative. But like voting by mail, at the moment, voting via Internet does not completely exclude the possibility that the vote was not given according to the principle of free vote.

The *principle of secret voting* states that a vote can be given in such a way that nobody can find out how a person voted. This also addresses the question how the principle of secret voting can be protected. There are two aspects to this: First, it has to be made sure that no manipulation of the votes can occur. Secondly, no other party or person is allowed to read any particular vote and trace it back to the person who has given the vote. Thus, a system has to be developed for e-voting that all e-votes can be counted correctly, and it checks if it was a valid vote coming from the right person. But at the same time it should be impossible to trace back any vote to the person who sent it.

To conclude this section on e-democracy, it is appropriate to highlight the fact that in order to guarantee secret voting, in the strongest sense, and to incorporate the principles of traditional Western democracies in this context, it would be necessary to redefine these principles and to develop new technological tools that allow us to achieve them in the Knowledge Society.

3. KNOWLEDGE AND E-DEMOCRACY. A NEW DEMOCRATIC SYSTEM BASED ON THE WEB

At the beginning of the twenty-first century, the use of the web should not be limited to that of technical support in making the election process more agile. To adopt such a narrow approach would mean to face enormous social opportunity costs by not taking advantage of its potential for purposes directly related with the essence of the evolution of human beings. Capra (1998) has indicated the three essential characteristics of living systems: *pattern* (the “autopoiesis” of Maturana and Varela, 1992), *structure* (the “dissipative structures” of Ilya Prigogine, 1967) and *process*. In this latter case, the vital process of living systems is a cognitive one, which has allowed for the survival of the species.

In line with this vital process, the activities undertaken by human beings should be orientated towards the extraction, creation, management and diffusion of knowledge, this being understood as the interpretation of the information in a specific domain. Obviously, this interpretation is something personal and subjective. In this sense, both the scientific method followed in problem resolution and the decision-making tools (*analytics* and *informatics*) developed to assist in decision-making, must allow for the incorporation of the intangible, the subjective and the emotional, in this way guaranteeing the scientific rigour of the processes being followed (Moreno, 2003).

If what we desire is an effective, efficacious and efficient⁵ democracy, as it is required for social systems that conform to the holistic view of reality, we must begin by correctly establishing the criteria that must guide the operation of democratic systems.

Supposing that the creation and diffusion of knowledge, combined with direct inclusion of the citizens in the governance of society, are the essential objectives of the new electronic democracy (e-cognocracy), then all the steps taken must lead in this direction. In this sense, the new democratic system should allow the participation and involvement of individuals in any (or most important) decision-making processes related to their own government. It should in this way allow for the creation and diffusion of knowledge with respect to the problem in question and, fundamentally, to the scientific method followed in the resolution of that problem.

As the introductory quotation cited at the beginning of this paper states, there is no democracy without freedom and no freedom without knowledge. When we speak of freedom, we are not simply considering the physical conditions of individuals and organizations, a necessary but not sufficient condition, but are also referring to the idea that citizens have a minimum “*formation*”. The formation is the ability to transform information into knowledge in such a way that the analysis of the problem is at all times placed in context.

Knowledge is understood as the beliefs, facts and rules that are valid in a specific domain or, as mentioned earlier, the interpretation of information in a given context (Moreno-Jiménez and Mata, 1993). It is clear that any interpretation of reality has its subjective element that, in the past, was ignored so as to guarantee the rigour of the classic scientific methodology, characterised by its objective, causal and verifiable nature.

⁵ It is understood to be effective if it corresponds to the essential postulates of social systems; to be efficacious if the goals signalled for the “relevant” criteria selected in the earlier stage are achieved; and to be efficient when the democratic process functions with the best allocation of resources in economic terms.

In recent years, and as a result of the change of the philosophical paradigm that has taken place in society (new missions and objectives for humanity as a whole), the neutrality of values required by the traditional scientific approach, that is to say, the exclusive consideration of the objective, the tangible and the rational, has been abandoned. Instead, an attempt is now made to integrate the vision of all the actors into the models employed in the scientific problem resolution process. It is necessary, therefore, to use methodological approaches that are more flexible and realistic than the traditional ones, in such a way that the subjective, the intangible and the emotional are explicitly incorporated in the decision-making processes.

If, in the past (Moreno Jimenez, 2003), science directed itself towards *the search for truth* through a rational treatment of the objective, then over the course of the next few years and both within this holistic view of reality and in agreement (and consonance) with the evolution of human beings, it should direct itself towards *the search for knowledge*, through an objective treatment of subjective and emotional elements.

When we speak of the search for knowledge, this should be understood as the substantial or relevant knowledge of each case, taking into account that the relevant knowledge of any “small world” is closely related with the substantial knowledge of the “large world” in which these smaller ones are immersed, i.e., with the knowledge that allows for the improvement of the social system and, essentially, the evolution and perpetuation of the species.

In this line, the democratic system should be in harmony with the vital (cognitive) process of human beings. To that end, it is appropriate to develop decision-making tools that will allow us to detect the patterns of behaviour of the different groups involved in the resolution of a problem concerning the government of the citizenry, and to extract the knowledge relative to the problem (product), processes and persons involved.

The extraction and diffusion of this knowledge, which basically corresponds to the application of scientific methodology to the resolution of problems, is closely related, as Habermas (1995) indicates, to the ideal line of thinking in modern democracies.

The new democratic proposal based on the use of the Internet and reflecting the evolutionary nature of living systems and the holistic view of reality, to which we have given the name *e-cognocracy*, can be captured by the following points:

1. Citizens can choose between either participating in the democratic system, placing their confidence in a political party as they have traditionally been doing (e-voting); or citizens involve themselves directly in the resolution of problems, contributing opinions and ideas that will allow for an improvement in our knowledge of the decisional process followed by the system (e-cognocracy).
2. Parliamentary seats will be distributed in two parts: (i) one occupied by the traditional political parties as is habitually the case (the parties' part) and (ii) the other part is reserved for those citizens who wish to be directly involved in the democratic process (the citizens' part). The percentage assigned to these two parts of the parliament is a critical parameter of the new procedure: A significant part of a successful public implementation will depend on the political attention as how this threshold parameter is selected. In principle, a value in the interval between 60% and 80% for the parties' part and the rest for the citizens' part seems to be reasonable. There is no reason why these values should be static, as is the case with preferences, given that they can be adapted in line with the

interest shown by the citizens in this form of participation. In any event, it is suggested that there is a minimum of 50% for the parties' part.

3. Not all the themes have to be solved by a mandatory participation of all the citizens. As we know from some existing legal systems, criminal charges can be tried by a popular jury in certain circumstances, but in others not. Something similar could be possible here. The selection of topics and questions that will be discussed and decided in the process of e-cognocracy is another important aspect of the proposal. Both, the number and frequency of the questions that will be posed for decisions by a specific group, as well as the type and contents, will be crucial elements of the political system. The political culture of a country will have an important role in the implementation of such a new democratic proposal.
4. The direct involvement of citizens in political decision-making is orientated towards the improvement and diffusion of social knowledge. Also the proposed topic and the wish of expanding knowledge relative to the scientific method will be important for the resolution of the problem. In order to begin such a new political process, consideration could be given to the proposals made by the traditional parties and thereafter, with the help of a "*facilitator*", that is to say, a specialist in scientific decision-making. Thus, it would be possible to propose and prepare decision problems, and to extract the relevant knowledge for the political learning process.
5. This relevant knowledge of the problem refers to patterns of behaviour, preference structures, stylized facts and trends. As a starting point in the search for consensus between the parties (political parties and groups of involved citizens), we could think in terms of obtaining an initial preference structure which reflects what is common in the opinions of the actors involved, that is to say, the nucleus with respect to some attribute considered in the problem (for example, the consistency referred to in Moreno-Jiménez et al., 2002).
6. The resolution of the problem will eventually consist in the ranking of a set of discrete alternatives, from amongst which either the best alternative or a set of alternatives would be selected. To deal with these types of situations it is necessary that we employ a multicriteria framework that allows for the resolution of problems with multiple scenarios, criteria and actors, and in which the incorporation of the intangible and subjective aspects is fundamental for the resolution of the problem.

E-cognocracy reflects the following characteristics:

- a) It allows for the direct involvement of the citizens, thereby potentially endorsing their participation in the democratic system.
- b) It improves the control of the political system, it could reduce unintended influences and dependencies on minority groups, in that there will always be a margin of votes to be won in each problem and moment in time. This will lead to more extensive coalitions between groups that, in turn, will favour more centrist and majority-supported positions.
- c) It improves the overall knowledge of the system, strengthens the discussion, the debate of ideas and leads to more negotiations and search for consensus processes. Although from a practical point of view (the world of realities), the final solution is directed towards more centrist and less extreme positions, this is

not the case from a theoretical point of view (the world of ideas). Here the improvement of knowledge can emerge from postures that are in total confrontation that, in turn, will favour learning, given that a larger conceptual spectrum is thereby made available.

- d) It facilitates the continuous “formation” of the population interested in it. One of the objectives of Rawlsian social justice is the equality of social opportunities. Of course, there will be individuals who do not wish to participate in the system, and it is questionable whether they should be obliged to do so. Having said that, this continuous formation should allow for equality of opportunity for all those who show an interest in it.
- e) It permits the easy expansion and diffusion of knowledge, as well as the creation of certain minimum ethical standards and the consideration of more sustainable lifestyles. All this is favoured by the actuality and interest of the themes being debated, which will help in spreading the ideas and values that emerge from the discussion.
- f) The proposal is not a new procedure for assigning representations in democratic systems, in the line of the approval voting followed by Brams and Fishburn (2003) or in more general situations where the intensity of the approval is given; it is rather a radical change in the orientation given to these systems. Thus, instead of searching for the election of representatives, what is sought is the creation and diffusion of knowledge derived from scientific decision making in the government of the citizens.
- g) The multicriteria framework proposed to deal with the specific part (direct involvement of the citizens) allows for the subjective to be incorporated through values and judgments. Here we should note that the objective treatment of the subjective would guarantee the scientific character of the procedure being followed. As Bernard Roy (1993) suggests, this scientific character will be given by the rigor, transparency and accessibility of the method applied.

With respect to the two basic processes (e-discussion and e-voting) considered for e-democracy in Subsection 2.2., e-cognocracy adds a third one, e-cognition, oriented towards the extraction and diffusion of the knowledge (learning) relative to the decision making process. Following the constructive approach, or the European school of decision analysis (Roy, 1993), we incorporate a new step in the traditional problem resolution process directed towards exploiting multicriteria models in order to learn about the processes and procedures involved (the “value added” of knowledge).

Obviously, when we speak of the use of the computers and the network (Internet) in any process of decision-making, a number of doubts arise with respect to confidence in the web and the security of the system, something that can be nowadays solved by technically quite advanced systems as e.g. the electronic signature. Properties such as authenticity, integrity and confidentiality should be perfectly guaranteed through the use of appropriate tools such as the PKI (Public Key Infrastructure). In this sense, Simon French⁶ suggests that the necessary attributes of this type of system are competence, objectivity, justice and consistency (<http://www.esf.org>).

⁶ See *Managing and communicating risks: Implications for e-democracy*. Manchester Business School.

4. A MULTICRITERIA FRAMEWORK FOR THE NEW DEMOCRATIC ERA

We have previously mentioned in Sections 2 and 3 that the essence of the new e-democratic system, e-cognocracy, is the creation and diffusion of knowledge associated with the processes involved in the e-governance of society. Taking this into account, the goal which has to support the new decisional tools, oriented towards assisting citizens in the decision making process corresponding to highly complex problems of society, is to provide the actors participating in the resolution of the problem with a better knowledge of the process under consideration, as well as the procedures, methods and techniques applied to it.

In this sense, the multicriteria paradigm establishes an appropriate conceptual framework, in accordance with the multiple scenarios, criteria and actors considered in the resolution of any complex problem. Moreover, the multicriteria decision-making techniques provide us with a variety of tools to assist in the different stages followed in the scientific resolution of the decisional problems. Nevertheless, when talking about the application of scientific methods for decision-making, this does not correspond exclusively to the traditional approach that is based on the substantive rationality paradigm.

The meaning or acceptance given to the “scientific method” concept has been made more flexible and updated in response to the new tendencies and paradigms in decision-making (Moreno-Jiménez, et al., 2001; Moreno Jiménez, 2003). Considering the Bayesian approach formulated in the context of “Toward Electronic Democracy, 2003” (<http://www.esf.org/publications/161/ted.pdf>), the multicriteria techniques used in the decision analysis field can be employed to assist the actors involved in the resolution problem in any of the stages followed in its resolution (structuring, modeling, resolution and risk assessment and communication).

Under the cognitive orientation proposed for e-cognocracy, two of the essential contributions of the multicriteria techniques consist of the integration of the visions and opinions of the different individuals involved in the resolution process (Moreno-Jiménez, et al. 1999, 2001), together with the aggregation of their preferences in a social choice context. The problem is how to aggregate the opinions and preferences of the members of a group in order to arrive to a preferred, consensus-based or compromise decision.

Interest in the multiactor setting is increasing for the following reasons, among others: First, the scientific method is important since it allows the incorporation of formal decision-makings in the resolution of problems which compromises the visions of the realities from all the actors involved in this interaction process. Second, the power of the network in the creation and dissemination of knowledge is important. Finally, the number of situations in which it is necessary to combine spatially distributed information and knowledge.

The search for consensus, understood as the touchstone of truth and the guarantor of correctness in matters of belief and on matters of decision and action (Rescher, 1993), is one of the fundamental aspects of liberal ethics, as well as of liberal democracy itself (Moreno, 1995; Kuczewski, 1995; Koch and Rowell, 1999).

Together with the argument of Kuczewski (1995) in favor of consensus in a liberal democracy, because moral uncertainty can be managed, we suggest another argument that justifies consensus as a valid strategy in the search for knowledge in social decision making. This justification rests on the fact that the determination of the core of

consistency in group decision making (Moreno-Jiménez et al., 2002, 2003) allows us to extract relevant information (patterns of behaviour and critical points) about the decision making process followed by the system. Thereafter, the interpretation of this information in the context of the problem provides us with the relevant knowledge for the problem (Aguarón et al., 2003).

Moreno-Jiménez, et al. (2002) present a new proposal oriented towards identifying the core of consistency in AHP (Saaty, 1980) group decision making, when the Row Geometric Mean is used as the prioritization procedure and the Geometric Consistency Index (Aguarón and Moreno-Jiménez, 2003) as the inconsistency measure.

The procedure consists of constructing, in an automatic way and without the direct intervention of the actors, the *Consistent Consensus Matrix* (CCM) for the group. In this incomplete interval judgment matrix, the different entries reflect the range of values for a specific judgment in which all the actors are simultaneously consistent in their initial judgment matrices.

The preference structures derived from this CCM, that is to say, the incomplete interval matrix that reflects the agreement zones for the actors' judgments, inform us about the underlying structures in group-preference modeling. Moreover, this information can be used as an initial step in any negotiated decision making situation (Moreno-Jiménez et al, 2002).

This method, whose theoretical basis can be seen in this paper, has an immediate application in the e-democracy field, in that it allows us to detect the agreement zones in consistency for the judgments elicited when comparing the alternatives under consideration.

From these agreement zones (interval judgments), or, perhaps more precisely, from the preference structures derived from the usually incomplete CCM, we can obtain the most likely patterns of behavior, the most stable trends and the critical points of the decisional process (critical judgments, critical alternatives, critical criteria and critical actors). This, in turn, will favour the learning process associated with the problem of resolution from the cognitive perspective, which guides the evolution of living systems.

To facilitate the application of the methodology suggested in the above-mentioned paper, we have developed a spreadsheet module, see Moreno-Jiménez et al. (2003), that provides us with some numerical and graphical information about the evolution with respect to the inconsistency level of the preference structures associated with the CCM.

As an example of the potential the multicriteria methodology and the associated software offer in the search for knowledge under the e-cognocracy perspective, we present a simplified situation corresponding to three actors ($A^{[I]}$, $A^{[II]}$, $A^{[III]}$) who have to choose between four alternatives (A, B, C, D).

If the respective reciprocal pairwise comparison matrices are given by:

$$A^{[I]} = \begin{array}{c|cccc} & A & B & C & D \\ \hline A & 1 & 3 & 2 & 5 \\ B & 1/3 & 1 & 1/2 & 1 \\ C & 1/2 & 2 & 1 & 3 \\ D & 1/5 & 1 & 1/3 & 1 \end{array} \quad A^{[II]} = \begin{array}{c|cccc} & A & B & C & D \\ \hline A & 1 & 1/3 & 1/2 & 2 \\ B & 3 & 1 & 1 & 4 \\ C & 2 & 1 & 1 & 3 \\ D & 1/2 & 1/4 & 1/3 & 1 \end{array}, \quad A^{[III]} = \begin{array}{c|cccc} & A & B & C & D \\ \hline A & 1 & 1 & 1 & 3 \\ B & 1 & 1 & 1/2 & 2 \\ C & 1 & 2 & 1 & 2 \\ D & 1/3 & 1/2 & 1/2 & 1 \end{array}$$

Then the individual priorities, the inconsistency levels (GCI) and the associated rankings take the form:

Table 1. Individual priorities and GCIs.

Alter./Actors	$A^{[I]}$	$A^{[II]}$	$A^{[III]}$
A	0.4872	0.1638	0.3084
B	0.1330	0.4013	0.2343
C	0.2740	0.3375	0.3314
D	0.1058	0.0974	0.1259
GCI	0.0451	0.0412	0.1075

Table 2. Rankings of alternatives

Ranks/Actors	$A^{[I]}$	$A^{[II]}$	$A^{[III]}$
1	A	B	C
2	C	C	A
3	B	A	B
4	D	D	D

The Consistent Consensus Matrix for the group, when the permitted inconsistency level corresponds to the 10% of Saaty’s Consistency Ratio (CR), is given by:

$$A^{[C]} = \begin{matrix} & \begin{matrix} A & B & C & D \end{matrix} \\ \begin{matrix} A \\ B \\ C \\ D \end{matrix} & \begin{bmatrix} 1 & & & 2. - 2.39 \\ & 1 & 0.5 - 1. & \\ & & 1 & 2. - 3. \\ & & & 1 \end{bmatrix} \end{matrix}$$

From this incomplete judgment matrix, the preference structures (PS) that are derived, together with their probabilities, and the probabilities of the best alternatives are:

Table 3. Preference Structures and probabilities.

Structures	Probabilities
C>B>A>D	0.1504
C>A>B>D	0.6537
A>C>B>D	0.1959

Table 4. Probabilities of the best alternatives

A	0.1959
B	
C	0.8041
D	

When changing the considered inconsistency level, the evolution of the probabilities of the resulting preference structures are given by Fig. 1, whilst the evolution of the probabilities corresponding to the best alternatives is given on Fig. 2

Fig.1. Values paths for preference structures

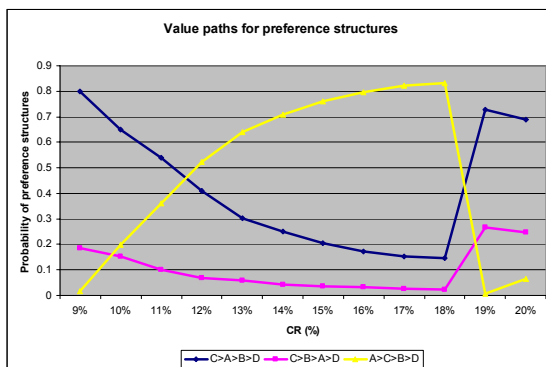
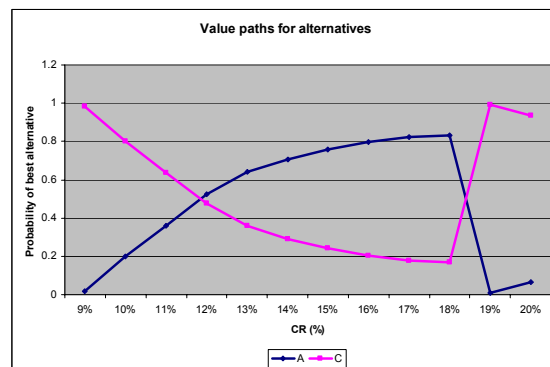


Fig. 2. Value paths for alternatives



From a study of these graphics, and their associated numerical results, we can derive the knowledge corresponding to the underlying patterns and the critical points of the decision making process. For example, we can see that when the inconsistency level is between 9% and 20%, only three preference structures (PS) appear: (C > A > B > D); (C > B > A > D) and (A > C > B > D). The two PS where C is the best alternative follow a similar evolution. With respect to interval judgments included in the CCM, attention should be drawn to the fact that for an inconsistency level between 9% and 18% there are only three entries in the CCM (a_{34} , a_{23} , a_{14}) in which there is an agreement zone in consistency. A CR greater than 19% is necessary to incorporate a fourth entry (a_{13}), which causes a rank reversal ($a_{13} < 1$) between the two best alternatives (A and C). From an individual perspective the most critical judgments, alternatives and criteria with respect to some relevant attribute of the problem can be obtained following the procedure described in Aguarón and Moreno-Jiménez (2000) and Aguarón et al. (2003).

In concluding this section, where we have considered a multicriteria framework for the new e-democratic system (e-cognocracy), it is important to note that consensus in group decision making does not guarantee the ethical and moral considerations of the decision

making process followed by the system (Cook et al., 1989). Moreover, in a cognitive context, there is no reason why the consensus between the actors must be the best way to increase our knowledge about the problem and procedures followed in its resolution.

5. CONCLUSIONS

If there is one key factor in the cultural and social transformation through which mankind has been passing during the last quarter of the twenty century, it is the development of the new technologies or, in other words, the influence that information and communication technologies are having over the behavior of individuals and the organizations or systems into which they are grouped.

To provide solutions to the major societal challenges in our everyday lives, the Sixth Framework Program of the European Community has established several priority research lines (1.1.2 Information Society Technologies (IST); 1.1.7 Citizens and Governance...). These will contribute directly towards realizing European policies for the Knowledge Society, as agreed at the Lisbon Council of 2000, the Stockholm Council of 2001, and reflected in the e-Europe Action Plan.

Following this line of thinking, and in accordance with the new challenges for the Knowledge Society of the 21st Century, this work has formulated the general ideas for a new democratic system, called e-cognocracy. As well as allowing for a greater integration of the citizens in their own governance, and in accordance with the most recent evolutionist theories, the aim of this proposed system is to direct the citizens' efforts towards one of the essential activities of living systems: the creation and diffusion of knowledge referred to the decision making process followed by the system, and the procedures employed by it in the scientific resolution of the problem under consideration.

In the context of the Knowledge Society and of e-governance, this new democratic system, e-cognocracy, offers a new platform for the direct participation of the citizen in governance. This new organizing approach is oriented towards the education of society in values related with participatory and spatially distributed democratic and science-based decision-making.

In this sense, it is necessary to develop new decisional tools, such as scenario planning, advanced visualization tools, web accessible group support systems and general decision making tools, etc., that improve the transparency of the process. More precisely, attention must be given to the articulation of individuals' conflicting interests, the communication between the actors involved in the resolution process and the effectiveness, efficacy and efficiency of the negotiated processes.

Our proposal reflects four main characteristics. First, it incorporates the new tendencies in scientific decision making, that is to say, the inclusion of the subjective, the intangible and the emotional, with special emphasis being placed on the human factor. Secondly, it uses the multicriteria decision making paradigm as its methodological support. Thirdly, as operational support, it offers a series of decisional tools which, implemented in interactive decision support systems and connected in networks, allows to take advantage of the potential offered by the new technologies to facilitate the tasks faced by individuals and systems as regards their own management and government. Finally, it favors the development of socially recognized and sought after values, such as knowledge, freedom, peaceful coexistence, formation, participation, self-governance and integration (meaning the elimination of geographical, cultural, political and technological barriers).

Although this work is placed exclusively in the context of one of most widely used multicriteria decision making techniques (AHP), its underlying ideas (the search for consensus in consistency) can be extended to the other multicriteria schools.

In this sense, the research line followed in this paper opens the way to one of the areas of multidisciplinary collaboration with the brightest future in the ambit of the knowledge society, that is to say, the integration of decision support systems, multicriteria techniques and citizens' e-governance. In summary, we seek to develop tools which - orientated fundamentally towards the human factor and its full participation in the Information Society - make it possible for all individuals to gain access to a multitude of services and applications and, in general, to knowledge. This requires the integration of communication and computer networks in a context of barrier-free technologies and easy-to-use human interfaces.

Obviously, there are many questions, both technical and philosophical-methodological, which remain open and need further detailed consideration. From a technical point of view, the decisional tools (data mining, artificial intelligence, simulation, prediction, visualization...) employed in knowledge management (Tissen et al., 1998), running from its extraction, up to its representation and, finally, its exploitation, must be studied in greater detail than is possible in this purely precursor, motivator and introductory work.

From a more philosophical point of view, there is a fundamental element in the success of any social innovation such as the one that is proposed here. If, in general, society or, more precisely, its leaders, are often resistant to structural changes, they will be all the more so in cases like this, which has an impact on two of the most important pillars of powers: representation and knowledge.

The proposed e-cognocracy has a direct effect on the political class, in that it relates to the quality of the representation and the transparency of their management, which will be conditioned by the creation and diffusion of the knowledge that is characteristic of e-cognocracy. This element could have an unfavorable impact on the group that must finally present and approve, if this is the case, the proposal. The fact that the politicians must give their consent to a measure that has a direct effect upon them could obviously condition the social acceptance of that measure.

To encourage this process, it would be appropriate to establish a program aimed at educating citizens, their leaders and, in general, society at large, in the line proposed here for self-organised dynamic systems. The search for knowledge in a continuous process of participation and improvement is the road towards social progress, with this being understood in an evolutionary context as life-long continuous learning.

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