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# REQUIREMENTS FOR A PUBLIC PARTICIPATION SUPPORT SYSTEM

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## **Abstract**

Citizens are increasingly looking for more direct involvement in the decisions that affect their collective well-being. Political representatives, official entities and experts are no longer considered to be the only ones responsible to make decisions regarding local policy issues. The challenge is to allow thousands of potential participants (citizens) to engage in the discussion of those issues. Contrary to opinion polls and surveys, this must be an informed participation based on a community knowledge base that is being built along the process. Also, some effort must be made to find common opinions, views and options among the participants. Computational support for these processes is a key issue. As the Internet is becoming widely used it seems to be the natural infrastructure on which such a support system may be built. Techniques developed to support groups may be adapted to cope with a large number of participants. It is our conviction that the necessary conditions now exist to promote and support citizens' participation in local issues decisions.

## **1. Introduction**

In this paper we analyse the need for public participation in local policy issues and present several concepts regarding it. We then define our own understanding of a public participation process, including the main objectives it is supposed to achieve. Our aim is to propose a way to organise those processes and to identify the support requirements that they impose. Considering the developments of Information and Communication Technologies (ICTs) we lay out the architecture of a system designed to support such processes.

Internet, and particularly the World Wide Web (WWW), has become part of our daily lives, changing the way we access information, the way we do business and the way we interact with other people. Computer and WWW literacy is rapidly improving and the WWW network is now considered as another mass medium, accessible and used like radio, television, and newspapers. Almost every aspect related to our day-to-day life can be dealt with through the Internet. Even our relation with government institutions is slowly changing as E-Government initiatives become more

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common. The aim of these initiatives is usually to improve the way administrative processes are conducted (E-Administration) and less often to promote public influence on political decision processes (E-Democracy). The later are also referred to as virtual democracy, teledemocracy, cyberdemocracy and digital democracy initiatives. [Hacker and van Dijk, 2000] define *digital democracy* as “a collection of attempts to practice democracy without the limits of time, space and other physical conditions using ICT (Information and Communication Technology) and CMC (Computer Mediated Communications) instead, as an addition, not a replacement for traditional ‘analogue’ political practices”. But even digital democracy initiatives often restrict themselves to one-time electronic voting or surveying processes leaving out the possibility that “common citizens” regularly participate and influence public policy decision processes, particularly in local policy problems or issues. These are often characterised as complex societal problems, “because of the dynamic character of the problems, the many phenomena included, the many actors involved and the impact these problems have on society” ([DeTombe, 2001]). It is true that, in some of the public policy decision processes, relevant information is now available through the Internet and sometimes it is possible to convey our opinions and suggestions to the public authorities involved. But does that mean that we, as citizens, are truly participating in those decision processes?

Attempts to support public participation with ICTs have been made in different research areas. Geographical Information Systems (GIS) research is considering a participatory approach to local and regional spatial planning and proposed new types of systems, Public Participation Geographical Information Systems (PPGIS - [Carver *et al.*, 2001]) and Planning Support Systems (PSS - [Geertman, 2002]). These systems aim at supporting the participation of entire communities of “common citizens” in the planning process or simply to support the work of distributed groups of planners. They range from surveying or polling web tolls ([Al-Kodmany, 2001]) to information and discussion support tools. However, these systems are essentially based on geographical information (e.g. maps), which require some specific skills to manipulate and understand and therefore may exclude a vast group of “common citizens” to participate. They are also naturally more adapted to planning processes in which maps have a central role, but they may be not suitable to public participation policy setting processes where contributions are not necessarily geographically referenced. Another research area where public participation support is currently being considered is Group Support Systems (GSS). [Turoff *et al.*, 2002] proposed a Social Decision Support System (SDSS) to “support the investigation by large groups of complex topics about which many diverse and opposing views are held”. However, these attempts have so far concentrated on gathering and organising contributions from public participation, but they have not explicitly tried to support the convergence of participant’s views, opinions and options. This is the major goal of our work: propose a way to organise a public participation process and provide the necessary support so that participants relate their contributions with others’ and try to express common views, opinions and options. The aim is not to produce a single, consensual document but

to collaboratively write as many documents as necessary to reflect all different points of view, opinions and proposed actions.

The remaining of this paper is organised as follows. The next section presents the main concepts regarding public participation and our understanding of those concepts. Section 3 analyses the general requirements of a public participation process and reviews developments in several research areas that may provide support for such processes. Section 4 and section 5 present our proposal on how to organise and support a public participation process. Finally some conclusions are presented in section 6.

## **2. Public participation**

According to [Barker, 1979], “‘Participation’ or ‘involvement’ is taken to mean those cases or circumstances in British public affairs where ‘ordinary’ citizens (that is, those who are neither elected nor appointed public office-holders) have or seek to have some direct relationship with the official decision-making process”. However, the concept of direct relationship is not clear in this definition. For instance, [Arnstein, 1969] states that “citizen participation” is a categorical term for citizen power. To emphasise this point of view, she proposed a typology of eight levels of participation: “Manipulation”, “Therapy”, “Informing”, “Consultation”, “Placation”, “Partnership”, “Delegated Power” and “Citizen Control”. The first two levels actually were “non-participation” levels designed to substitute genuine participation. On the next four levels citizens were allowed to express their opinions, although they still had no power to insure that their views would influence the final outcome. On the top two levels citizens could negotiate and engage in trade-offs with traditional power holders, obtaining the majority of decision-making seats, or full managerial control. More recently, [Wiedemann and Femers, 1993] proposed a revised typology for public participation. Starting from the “Public right to know” and “Informing the public” it steps up to the “Public right to object” and “Defining interests and determining the agenda”. At the top we find “Assessing risk and recommending solutions” and “Public participation in the final decision”.

The purpose of public participation has also shifted from the 1960s and 1970s intention to democratise and legitimate policy making ([Arnstein, 1969]), to the participation of stakeholders to increase the quality of policy analysis and support for policy making. [Bongers, 2000] defines stakeholders, policy-relevant actors or parties as “organisations and individuals whose interests are affected by the policy under discussion”. The assumption is that relevant stakeholders can provide important high quality information – besides the use of scientific data – to be used as an input in policy making ([Bongers, 2000]). [Renn *et al.*, 1994] consider that, besides expert/scientific and stakeholder information, a public participation process should include the views of “ordinary” citizens. This “ordinary” citizen participation is crucial for a number of reasons. First, it allows to overcome the shortfalls associated with stakeholder representation in deliberative institutions

([O'Neill, 2001]). It is not often easy to identify all interests to consider and find correct representation for them. Even then, particular citizens may consider themselves misrepresented by those who act as stakeholders on behalf of his/her interests. Also, especially in local policy issues, "ordinary" citizens may prove to be experts in some field where they have experience and/or knowledge at least as relevant as the "official" expertise. Their potential contribution (such as ideas, comments and solutions) is simply disregarded if they are excluded from the decision process. Ultimately, not only the success of implementing the outcome of a decision process depends on the acceptance by the citizens involved, but also, it is the cornerstone of democracy that they should influence that outcome. [Mumpower, 2001] concludes this line of reasoning stating that the proposition that greater levels of public participation would improve public decisions derives from two antecedent assumptions. First, that the process would be improved by including persons with perspectives and knowledge that would otherwise be missing. Secondly, support for adopted policies would be stronger if the public had better information and more access to the process. The question is then to what extent do we want public participation and what kind of support do we want for it.

When addressing the issue of public participation what comes to mind is some kind of voting or survey procedure. This reflects common practices in urban planning: local authority planners present "their" plan for consultation at the end of the planning process. By that time most of the decisions have been made and the plan represents a major investment in time and effort. Not surprisingly, there is a general reluctance among those responsible for the plan to alter it in any significant way at this late stage. The planners' priority will be to defend already made decisions enshrined in the documents rather than arrive at new decisions or fundamental revisions through further debate ([Tweed, 1998]). To overcome these situations, [Stewart, 1997] states that official planners should access the informed and deliberative views of citizens, instead of opinion surveys. These may at times only give access to the immediate response of the public to issues on which they may not be informed and may even not have considered before. In this context, [Lapintie, 1998] considers that planning should be considered as a discursive or argumentative process.

The same view is supported by [Niemeyer and Spash, 2001] when, citing [Dryzek, 1990], consider that the model of deliberative democracy is based upon the concept of politics as a process of purposeful determination by citizens of desirable ends and the means of their achievement. The aim is conduct a process to informing and help constructing preferences, shifting the emphasis from simple aggregation of existing preferences to focus on processes through which preferences are formed and transformed. So, despite the interest of reaching the top rung of the public participation ladder proposed by [Arnstein, 1969] and [Wiedemann and Femers, 1993], we must acknowledge that it is meaningless to have the possibility to decide without being able to access relevant information, to analyse and discuss it, and to express our own views.

### 3. Supporting Public Participation

A general requirement for a public participation support system is that it should support deliberative processes regarding local policy issues, based on informed public participation, allowing “ordinary” citizens to express and discuss their views surrounding a community/local issue. When used in the scope of a decision process sponsored by a local authority, it is up to that authority either to reach the final decision on its own, or to “climb” another step in the participation ladder and ask for a direct citizens’ decision.

Availability and easy of use is a key feature in such a system if participation is to be truly open to all citizens. The system should be able to accept written contributions and to organise them in a suitable way for posterior analysis. A particular important aspect is the possibility to submit documents (such as reports or plans). Since a primary objective is to maintain an informed discussion, it is fundamental that everyone has access to all relevant documents, especially if they are mentioned in any contribution.

We consider contributions from several fields of research, with a special emphasis on GSS because the *rationale* of a public participation process (besides the democratic nature) is the same of group work ([Turban and Aronson, 1998]): “A group has more information (knowledge) than any one member. Groups can combine that knowledge and create new knowledge. As a result, there are more alternatives for problem solving, and better solutions can be derived.”

In the context of a public participation process (as we address it) the term “group” should be understood not so much as a “decision making group” ([DeSanctis and Gallupe, 1987]) but more as a “community” ([Preece, 2000]) engaged in collaborative work. Nevertheless, efforts to provide technological support for public participation may be driven by the same basic ideas as those identified for groups ([McGrath and Hollingshead, 1994]):

- Overcoming space and time constraints

This is naturally a crucial aspect when supporting a public participation process. Even when dealing with local (as opposed to national) issues, participants (citizens) are geographically dispersed (as compared to a “decision room”) and may wish to participate at any time. These characteristics are even more decisive when we consider an extremely large number of participants. To deal with potential problems related with space and time constraints we looked into CMCS - Computer-Mediated Communication Systems ([Turoff, 1991; Hiltz and Turoff, 1993]) and DGSS – Distributed Group Support Systems ([Turoff *et al.*, 1993; Hiltz *et al.*, 1996]) research areas.

- Increasing information access

Public participation assumes informed participation. This means not only the possibility to access information but, more importantly, to organise and retrieve it. Discourse structures [Turoff *et al.*, 1999] provide a general framework to organise group generated information, while statistical tools efficiently support information retrieval ([Salton, 1968]). More recently,

ontologies are used to identify terms (a vocabulary) that represent the core features (common semantics) of an application domain ([Benslimane *et al.*, 2000]), thus improving the way information is understood.

- Improving task performance

Improving group effectiveness and avoiding process losses is a major concern of any group support system and the same principle applies to a public participation support system. In a deliberative public participation process only a subset of McGrath's circumplex of group tasks ([McGrath and Hollingshead, 1994]) are performed and need to be supported. These tasks are included in Quadrant I – Generate (creativity and planning tasks such as generating ideas and plans) and Quadrant II – Choose (choose a correct answer or preferred solution). Group support systems such as Electronic Meeting Systems – EMS ([Nunamaker *et al.*, 1991]) and Group Decision Support Systems – GDSS ([DeSanctis and Gallupe, 1987]) support decision making and related collaborative activities of work groups including those identified for deliberative public participation processes.

All of these research areas provide conceptual frameworks and computational tools, which combined, may be useful when considering computational support for a public participation process. The following sections will focus on some of those specific issues/techniques.

### **3.1. Communication infrastructure**

Early public participation processes were organised around one or several meetings where physical attendance was mandatory. Anyone wanting to participate was constrained by a fixed schedule that sometimes made it impossible to attend those meetings. Even when it was possible to attend, participation itself could be discouraged by the necessity of a face-to-face discussion. More important, lack of prior knowledge of fundamental information could lead to “misinformed” or “noisy” participation. At the end of such a meeting it was very difficult to summarise all relevant contributions in a way that would serve as basic information to the next meeting.

More recently, the potential of Internet for public participation has been widely acknowledged in the literature ([Sarjakoski, 1998; Evans *et al.*, 1999; Carver *et al.*, 2001; Peng, 2001]). According to [Schuler, 1994], using such a medium as a community network promotes participation because it is community-based (everyone as a stake), reciprocal (any potential “consumer of information” is a potential “producer” as well), contribution-based (based on contributions from participants), accessible and inexpensive.

Despite the fact that Internet is, due to its characteristics, a suitable infrastructure for a public participation support system, a major drawback still remains. Not everyone has access to Internet and is able to use the technology it requires. This means that a public participation process based solely on an Internet-based support system may exclude potential interested citizens. This division

of society between those who “can” and those who “can’t” is referred to as the *digital divide* ([van Dijk, 2000]) and is a major issue when considering such a participation process. However, it is a fact that every day more and more people are getting acquainted and start using the Internet and it is also possible to complement such an Internet-based process with a more traditional meeting process.

### **3.2. The divergent phase: idea generation and brainstorming techniques**

Such a deliberation process depends ultimately on the written contributions submitted by interested citizens. The stage when contributions are submitted corresponds to what [Orwig *et al.*, 1996] call the *divergent stage* of a discussion, when group members provide comments or ideas. [McGrath and Hollingshead, 1994] also recognise in their task circumplex (Quadrant I) generation of ideas as an important group activity. Several techniques were developed to support this activity, such as Nominal Group Technique ([Van de Ven and Delbecq, 1974]) or Delphi ([Linstone and Turoff, 1975]). This type of group idea generation techniques are based on the belief that interaction between group members creates a kind of synergy which allows them to build on the ideas of co-members and combine their ideas with others’. [Gallupe *et al.*, 1992] designate these techniques by *brainstorming techniques*: “... some people do hear ideas that prompt them to think of other ideas of which they might not have otherwise thought. As a result, brainstorming has strong appeal as a way for groups to generate ideas.”

However, some of the problems identified previously regarding face-to-face participation processes are also identified in the context of face-to-face brainstorming groups. [Gallupe *et al.*, 1992] refer to *production blocking* (when individuals cannot express their ideas because someone else is talking) and *evaluation apprehension* (when lack of anonymity and/or member status differences make individuals withhold their ideas) as two major problems that may occur in face-to-face groups. Once again electronic/computer support may help to overcome these problems ([Gallupe *et al.*, 1992]). In electronic brainstorming, all group members can simultaneously type ideas into a computer that distributes them to other group members (reducing the effects of production blocking) and all ideas may be anonymous (which may reduce the inhibiting effects of evaluation apprehension). In the context of GSS, several computerised meeting rooms have been built to support idea generation and brainstorming (e.g. [DeSanctis and Gallupe, 1987; Nunamaker *et al.*, 1991]).

### **3.3. Information overload**

Since the aim of this participation system is to encourage everyone to participate (every citizen), it is only natural that a huge number of contributions are submitted thus creating an information overload problem. [Hiltz and Turoff, 1985] define *information overload* in the context of CMCS as “the delivery of too many communications and an increase in social density that gives individuals

access to more communications that they can easily respond to, and what might be termed *information entropy*, whereby incoming messages are not sufficiently organised by topic or content to be easily recognised as important or as part of the history of communication on a given topic.” So, the problem arises not only because of the number of contributions but also because some contributions are too general (perhaps even without any relation to the discussion topics), others are too long (perhaps incorporating separate and unrelated contributions), others simply repeat contributions already submitted, and some are even not understandable!

If a high number of contributions is to be expected (and it is even desirable) then actually this should be regarded not as a (technical) problem but as a challenge: how to organise them in a suitable and efficient manner. Several techniques may help to deal with this problem, although some effort must be placed on the participants’ side (next section will detail this issue). The irrelevant/incoherent/understandable contributions pose a problem of a different and more delicate nature: how to eliminate/filter them without undermining the democratic nature inherent to a public participation process. Clearly it must be the responsibility of the participants, as a group/community, to decide which contributions add to the collective knowledge and should therefore be considered.

### **3.4. The convergent phase: idea organisation and synthesis**

The result of the divergent phase is a huge amount of meaningful contributions (even considering that they have been filtered as mentioned in the previous section) that need to be organised and synthesised in what [Orwig *et al.*, 1996] designate by the *convergent stage*. A major objective of this stage is to create a common set of concepts, definitions, or model among the participants (see section 3.5 below). Considering the amount of work and the difficulties associated with this stage, this is clearly a major area needing support. This support begins, at the first step of the convergent stage, by the organisation of received contributions. This is a task that clearly must be shared between the participants who submit contributions and the “process” (facilitator). The “process” may provide a discourse structure or argumentation model that serves as template to organise the contributions (categorise them and establishing relations between them). It is up to the participant to choose the correct category for his/her contribution and to establish the correct relations with other contributions. Once again computerised support may help the participant in those tasks by identifying potentially related contributions.

#### **3.4.1 Discourse structures and argumentation models**

[Turoff *et al.*, 1999] define *discourse structure* as “a template for a discussion structure which allows individuals to classify their contributions to the discussion into meaningful categories that structure their relevance and significance according to the nature of the topic, the objective of the discussion, and the characteristics of the group.”

The importance and type of a discourse structure to adopt depends on the number of

participants/contributions to organise and the type of analysis to perform on the contributions. For instance, a simple question-reply discourse structure like the one usually adopted in newsgroups may be suitable for a very large number of participants/contributions because no one is really much interested in analysing other contributions except those immediately surrounding his/hers. The same structure used by fewer participants with fewer contributions, may allow for some analysis to be performed. [Turoff *et al.*, 1999] propose elaborate discourse templates inspired in the process of scientific debate in common planning structures and extremely complex ones for specific technical areas.

Argumentation Theory also provides concepts for structuring discussions that go beyond the simple question-reply pattern of newsgroups. An implicit assumption is that contributions in a debate represent, or can be split into, argumentation elements that have a nonambiguous type and are organised in an argumentation model ([Rinner, 2001]). These can be divided into “Issue-Based” ([Kunz and Rittel, 1970]), “Toulmin-based logic” ([Toulmin, 1958]) and hybrid model schemes depending on the type of structure used to represent the argumentation material ([Tweed, 1998]).

There is no doubt that, in the context of a public participation process, every citizen is a potential participant and therefore a large number of contributions is to be expected. Also, since the aim of such a process is to build a community knowledge base (see section 3.5 below) resulting from the convergence stage, it is sure that a great deal of contribution analysis is necessary. Therefore, any discourse structure or argumentation model adopted must take into account these aspects and must go beyond the traditional and simplistic models adopted in the Internet. But the more complex an argumentation model is, the more probable the discussion turn into a “meta-discussion”. In no time participants forget the topics they were supposed to discuss and start discussing about the correct use and interpretation of the model components [Rinner, 2001]. For instance, a participant might be in doubt about the correct type of contribution (issue, position or argument) he/she is presenting in an IBIS argumentation model ([Kunz and Rittel, 1970]). Again we must take into consideration that citizens in a public participation process have different skills, and therefore it is necessary to choose a simple to use discourse structure capable of organising/structure a great number of contributions.

#### **3.4.2 Indexing/clustering contributions**

An important aspect of the convergent stage is the ability to find related contributions. Not only because it may help to set the correct place for a particular contribution in the discourse structure (see section above), but also because it can serve as a starting point to collaborative authoring/merging of contributions (see section below).

Since most of the effort must rely on the participants, it is very important that those tasks are supported. Automatic document indexing and clustering procedures (finding degrees of similarity) provide the necessary framework. Top-down content independent methodologies (e.g. [Chen *et al.*,

1994]) use automatic indexing procedures (word identification, stop-wording, word stemming and term-phrase formation) to identify subject descriptors in a set of documents ([Salton, 1989]). Then, using statistic measures such as *term frequency* and *inverse document frequency*, it is possible to compute the relative importance of each descriptor for representing the content of a document, forming a Vector Space Model ([Salton, 1989]). The Vector Space Model can be used to obtain correlations, or similarities, between pairs of documents on which cluster analysis can be performed. Bottom-up content dependent methodologies (e.g. [Lee *et al.*, 2002]) use the same principles but, since they are content dependent, start from previously built keyword affinity networks (which we may include in the definition of an Ontology – see section 3.5). Since these keywords represent domain dependent knowledge, it is argued that these methodologies produce more specific and “balanced” (same level of abstraction) clusters when compared with independent methodologies.

### **3.4.3 Collaborative authoring/writing**

Clustering related contributions is not the ultimate goal of the public participation process. It is possible to take the convergent stage a step further and support the synthesis of related (complementary) contributions. The goal is to produce as many documents as necessary to reflect all different points of view, opinions and proposed actions.

Among collaborative tasks, Collaborative Writing (CW) has been one of the major GSS and CMC research areas. The growing use of Internet and WWW as underlying environment for collaboration lead to the development of new tools to support distributed, synchronous and asynchronous, CW on the Web (eWriting - [Kim, 2002; Lowry *et al.*, 2002]). [Lowry *et al.*, 2002] proposes to structure the process for distributed asynchronous writing with a mix of face-to-face and asynchronous activities that range from “Preplanning/Formation” to the “Final Review” and include “Brainstorming” and “Outlining” (among others). These activities may in turn be used within three strategies for collaborative writing ([Sharples, 1993] cited by [Adkins *et al.*, 1999]):

- Sequential writing, where collaborators divide the task so that the output of one stage is passed to the next writer for individual work;
- Parallel writing, where collaborators divide the task so that each writer is working on a different part of the document and then the document is reassembled in an integration stage;
- Reciprocal writing, where collaborators work together to create a common document, mutually adjusting their activities in real time to take into account each other’s edits.

This later strategy seems to adequately describe what is meant in a public participation process.

Divergent and convergent stages are some times presented as being purely sequential, that is, the convergent stage starts only after divergent stage has finished. But a public participation process is an ongoing and cumulative process and therefore we believe that the task of organising a

new contribution may profit from the convergent efforts and results obtained on previous contributions.

### **3.5. Group memory/community knowledge base**

[Valacich *et al.*, 1989] defined *group memory* in GSS as “the ability to store the material generated in one session or phase for use in another”. This definition reflects the cumulative aspect of a GSS, that is, the possibility to allow groups to profit from previous meetings. A more comprehensive view is provided by [Lewis and Sycara, 1993] when they define group memory as a *shared model*, “a more comprehensive model of the problem at hand ... which incorporates elements of others' [agents'] expertise. The shared model between [two] agents also defines a common vocabulary that the [two] agents can use to communicate in an intelligible way.” This is in accordance with [Orwig *et al.*, 1996] when they identify as a main goal of the convergent stage: the “creation of a common set of concepts, definitions, or model among the participants.”

More recently, ontologies are emerging as an important tool for constructing sharable and reusable knowledge repositories, since they define common representation terms that provide mutual understanding of an application domain among group users. [Fonseca *et al.*, 2002] define ontologies as “theories that use a specific vocabulary to describe entities, classes, properties, and functions related to a certain view of the world. They can be a simple taxonomy, a lexicon or a thesaurus, or even a fully axiomatized theory”.

In the context of public participation we would call this group memory as “organisational, collaborative, or community memory” ([Hiltz and Turoff, 1993]), in accordance with [Schatz, 1991] definition of an *electronic community system*: “a computer system that encodes the knowledge of a community and provides an environment that supports manipulation of that knowledge.” This also reflects the view of [Turoff *et al.*, 2002] when they state that “the first objective of a SDSS is to facilitate the integration of diverse views into a growing knowledge base.”

### **3.6. Interface**

A major goal of a public participation process is to inform interested citizens and for that purpose it is crucial that, once information is collected and organised, it becomes available in an easy-to-find manner. Even if the architecture of recent collaborations tools can support very large groups, the interface cannot realistically support hundreds of users without being too clumsy and confusing (e.g. [Lowry *et al.*, 2002]).

Public participation geographical information systems ([Kingston, 1998; Obermeyer, 1998; Sarjakoski, 1998; Carver *et al.*, 2001]) use maps and plans to collect, organise and present contributions. These systems cover areas such as urban planning and natural resources management where related contributions have strong geographic references. However, this type of organisation

might not be enough to allow a deeper analysis of the contributions.

In the context of CMC, hypertext is viewed as a support tool to collaborative processes. [Turoff *et al.*, 1993] pointed out that “tools that incorporate aspects of hypertext appear to be very useful in supporting such group efforts in arriving at a shared cognitive mapping of an area of knowledge.” [Turoff *et al.*, 1991] define *hypertext* as “the non-linear organisation of concepts and thoughts in which the links between text fragments (nodes) are the organising entities”. One of the fundamental elements of hypertext ([Bieber and Kimbrough, 1992]) is the possibility to establish links between text, image and other items, thus revealing/representing the intricate relations that exist between different contributions. These networks of relations go beyond the traditional “tree-like view” usually used in “comment and reply” type systems and therefore are more appropriate to visualise large collections of information.

### **3.7. Facilitation**

Any participatory process, even the simplest one, is not straightforward to understand by those involved. If participation requires using some computerised system, then it becomes even more complex for some participants. In our case, since we aim at general public participation, it is crucial that some support is provided for both process and technology.

The person responsible for managing the process in which the group is involved is usually referred to as the *facilitator*, a kind of process supervisor agent ([Orwig *et al.*, 1996]). As participants are responsible for the content creation, the facilitator is responsible for managing the creation process. His/her tasks typically include organizing the process (defining the process stages and the sequence in which they should occur) and explain it to the participants. In the case where a computerised system is used to support the group, it is also his/her responsibility to assist participants in the use of technology thus increasing its effectiveness ([Dickson *et al.*, 1993]). But even enlighten participants constrained in their actions by powerful support systems are bound to deviate from the established process. For instance, one problem with group hypertext, in which members can create and modify both nodes and links, is that users tend to be careless about observing and following the overall structure ([Turoff *et al.*, 1993]). It is the responsibility of the facilitator to “correct” these unforeseen mistakes. Finally, the facilitator may also be asked to perform some activities necessary to the process itself, like those described in the convergent stage (section 3.4). Developments in GSS aim at replacing as much as possible these human facilitators’ activities although, due to their complexity, the goal is really to support human facilitators.

## **4. Public participation process**

On previous sections we have presented our understanding of public participation, the context in which we consider it, the goals it is meant to achieve and the state of the technology to support it. In this section we will propose how such a process is organised, emphasising that it is not meant to

be part of an institutional democratic process, that is, it is not bound by any legal constraints. This does not exclude any local authority (e.g. the City Council) to promote public participation and then use the results to “guide” its action. To describe our proposal for a public participation process we must begin by defining some basic concepts.

#### **4.1. Defining some basic concepts**

##### **4.1.1 *Sponsor***

A public participation process begins when someone or some entity decides to promote citizen debate on public interest issues. Typically, this entity will be an Official Local Authority, a Citizen Association or NGO and it will be referred to as *sponsor*. The final purpose of a public participation process depends mainly on the objectives set by the sponsor and its nature. This is an important aspect because it might influence the level of participation. Citizens might be discouraged to participate if they feel their contribution will have no real influence on decisions and actions. Also, they might be suspicious to participate in a debate promoted by biased, partial or non-trusted organisations.

Sponsor responsibilities include choosing the issue or issues to discuss, setting the time frame for the process and making available the material, human and financial needed conditions.

##### **4.1.2 *Facilitator***

It is expected that citizens with very different skills will intervene in the public participation process. This means that the role of a facilitator is even more crucial than in other group processes (see section 3.7), since he/she must provide extensive technical and task support. Also, such an open process is bound to attract “inappropriate” contributions. It is the facilitator responsibility to remove those contributions and block “inappropriate” participants. Once again the credibility of both sponsor and facilitator is very important to assure that the democratic character of the participation process is kept and no censorship exists. Finally, despite the efforts to provide computational support for the convergent tasks, it may be necessary that the facilitator intervene in those tasks.

##### **4.1.3 *Associated official entities***

In a discussion about local policy issues it is only natural that questions arise which can only be answered by official entities. It is not always the case that the “common” citizen has the opportunity to address those questions and obtain the relevant answers. It is therefore the goal of the public participation process to provide a communication channel between those citizens and official entities or public officials, especially those who represent them in the democratic institutions. It is the responsibility of the sponsor to associate as many official entities as possible to the public participation process making sure that such a channel exists. Questions and requests for documents may be addressed directly by the participants or through the facilitator.

#### **4.1.4 Participants**

In general, all citizens are potential participants in a public participation process. However, we will distinguish between two main types of participants based on their degree of participation:

- **Observers**

Some persons may wish to consult the evolution and results of the discussion without taking part in it. Since one of the major goals of a public participation process is to build a community knowledge base it must be possible for everyone, without restrictions, to access the information resulting from the process.

- **Contributors**

Contrary to the observers, these participants wish to actively take part in the discussion process. In order to do that it is necessary that they register first. This does not mean that the contributions will be nominal. On the contrary, all contributions may be presented in an anonymous way, thus avoiding problems like *evaluation apprehension* (section 3.2). The need to register derives also from the need to implement access security and manage the authoring/subscribing process (see explanation below). Also, it allows establishing a context to each contribution, as each participant is required to define his/her expertise (from his/her academic credentials or professional experience) and his/her conditions of stakeholder (e.g. address, or chosen from several options). Then, when submitting a contribution, instead of signing it, the participant may qualify it with an expertise and/or stakeholder condition (see section 4.4).

Since all contributors are also observers, when designing a public participation process it is their requirements that we must consider. Therefore we will refer to them either as contributors or participants.

#### **4.1.5 Contribution types**

There are several ways a participant may intervene in the public participation process. The most common way is to submit a text item with his/her proposals for policies and actions or comments (viewpoints, arguments, rationales or positions) about a certain issue. Within a text contribution every reference to a specific document or to specific data must be accompanied by the relevant documents. This means that another way to participate is to submit supporting documents (such as scientific articles, research reports, plans and maps, statistics or budget figures). Supporting text contributions with official documents is very important because it makes the discussion more focused and allows everyone to understand/discuss the contributions. Another way to contribute is to submit ontology items, that is, to suggest terms and corresponding definitions in order to build a common ontology as part of the community knowledge base. The way these contributions should be prepared and submitted will be further detailed in section 4.4.

Anyone may participate in the discussion at any time by issuing a request for document, asking

or answering a question. Requests for documents are particularly important if, when submitting a text item, the author is not able to provide the relevant supporting document(s). Any participant, associated official entity or even the facilitator may submit the requested document. It is also possible for any participant to address questions, regarding a specific contribution (text item or document), to an official entity or to a particular contributor and it is the responsibility of the respective author to answer it. Questions regarding the use of the supporting system or the process itself must be addressed directly to the facilitator. It is the responsibility of the facilitator to ensure, especially in the case of requests for documents or questions addressed to official entities, that those requests are properly attended.

#### 4.1.6 *Relations between contributions*

All these different contributions need to be organised in a way that facilitates its consultation and constitutes the base for collaborative authoring of text items (convergent task). We chose to organise these contributions using an hypertext network where the nodes represent the contributions and several types of links may connect them, as presented in Table 1. Some of these links have specific names that underline the nature of the relation. It is also possible to complement this explicit network with some “implicit” links resulting from similarities identified using the indexing statistical techniques such as described in section 3.4.2.

	Text item	Document	Ontology item	Request for document	Question	Answer
Text item	Merge	Support	Keyword	Link	Link	
Document	Support		Keyword	Link		
Ontology item	Keyword	Keyword	Related	Keyword		
Request for document	Link	Link	Keyword			
Question	Link					Link
Answer					Link	

Table 1 – Contributions and explicit links between them.

The fundamental contribution type is the text item containing proposals for policies and actions, viewpoints, arguments, rationales or positions. The goal of the public participation process is to stimulate participants to “merge” their contributions with other authors’ contributions thus collaboratively producing as many documents as necessary to represent all different points of view and opinions. This convergent task begins when the author of a contribution establishes a “merge” link between his/her contribution and another contribution, meaning he/she is convinced that his/her contribution could be “merged” with the second contribution. This link may be qualified with a description of the way the author expects the merging process to occur (simply including a new paragraph, replacing one paragraph by another, ...). This type of link is a “directed link”, that is, the author of the second contribution might not feel the same way. However, if they agree, that is, if the second author establishes a “merge” link in the opposite direction, then the “merging”

process may begin. This process will be further detailed in sections 4.1.7 and 4.1.8.

The remaining link types result from what was previously presented. Text item contributions are linked to their supporting documents or, if they are not yet available, to the respective requests. They are also linked to one or more questions issued by other participants. These questions are, in turn, linked to the respective answer. Ontology items (terms and respective definition) are linked between them to represent concepts and their interrelationships. Each ontology item may also be chosen as keyword to a text item, document or request for document, and therefore be linked to them.

#### 4.1.7 *Contributions status*

When we think of an open process, when everyone is able to contribute either with text items, documents or ontology items it is only natural that some of those contributions will be of low interest or even not understandable. One way to avoid/limit this problem is to allow the facilitator to decide which contributions should be accepted or not. This is however a tremendous task given the amount of contributions expected and could seriously damage the democratic character everyone associates with a public participation process. Another approach, which we adopt, is to delegate on the participants themselves the task of selecting relevant and meaningful contributions. This is done simply by requiring a minimum number of subscribers before accepting any contribution (text item, ontology item or document) in a permanent way. We then have contributions with two different statuses: “pending” and “accepted”. Immediately after submission every text item, document or ontology item receives the “pending” status, meaning that it has not yet reviewed and subscribed by a sufficient number of participants in the agreed period of time. Once the necessary number of subscribers is obtained those contributions receive status “accepted”.

Another status derives from the collaborative authoring process described in section 4.6 and applies only to text items. After successfully merging two “accepted” text items into a single new one, the initial text items receive the status “merged” meaning that they will no longer be available for the merging process as separate items.

#### 4.1.8 *Participant roles*

Depending on the type of contribution and on the collaborative authoring stage, it is possible to define several contributor roles as presented in Table 2.

	Author	Co-author	Subscriber	Presenter
Text item	X	X	X	
Document			X	X
Ontology item	X		X	
Request for document	X			
Question	X			
Answer	X			

Table 2 – Contributions and participant roles.

Every participant who submits a contribution is considered the author of that contribution. Even in public participation processes where contributions are to be presented in an anonymous way, this relation is maintained. This means that the author is responsible to define the “merge” relations with other contributions, to engage in collaborative authoring processes with other contributions and to answer any questions asked regarding one of his/her contributions. Documents are exceptions: participants are simply presenters and not authors of these types of contributions.

Regarding the text items collaborative authoring process, another role can be identified: the co-author. The collaborative authoring process starts with two text items (from two different authors) and (hopefully) ends up with a single one. It is necessary, for future collaborative processes, that this resulting item has only one author. The solution is to consider the other original author as co-author of the resulting text. Further along in the collaborative authoring process a specific text will have only one author (the main author responsible for carrying the process along) and several co-authors. This role is important because it makes possible to identify everyone who contributed to a collaborative text.

Subscriber of other authors’ contributions is another important role. This means that the participant agrees that contribution is relevant to the public participation process even if he/she does not agree with its content. As we explained in the previous section, the subscription mechanism works as a filter for non-interesting/irrelevant contributions.

With these basic concepts in mind, we may now proceed and describe the main actions proposed for a public participation process.

#### **4.2. Registering as a contributor**

Before anyone is allowed to start contributing to the discussion process it is necessary that he/she register first. The information required to register depends on the nature of the public participation process as specified by the sponsor. However, some general guidelines may be stated considering the process we propose. The main purpose of the registration is to allow some kind of traceability between contributions and authors (even in anonymous processes), which is fundamental to conduct the collaborative authoring process (providing the right authors with the means to join their contributions) and to the subscription mechanism (controlling duplicate subscriptions of the same item and allowing subscribers to withdraw their support). Registering allows to create “participant specific working areas”, where each participant receives information that directly concerns him/her such as pending questions, own contributions waiting for subscriptions, own contributions waiting to initiate or undergoing the collaborative authoring process and co-authored contributions evolution. Also, in anonymous processes it might be desirable to establish “participant information contexts”, that is, to present each contribution together with some information (established at registration time) about the author’s expertise and/or

stakeholder condition. Particularly in public participation processes concerned with local policy issues it seems also reasonable that the registration process is used to ensure that only “local” participation occurs. Finally, registering is important to guarantee access security and to establish some kind of accountability that may be used by the facilitator to block “inappropriate” participants (section 4.1.2).

### **4.3. Accessing the information**

It makes no sense to build a community knowledge base if it is not possible afterwards to access the information it contains in an easy and straightforward way. Within a public participation process this is a crucial aspect since the goal is to promote an informed debate as opposed to instant surveys or opinion pools. New contributions need to take into account previously submitted contributions in order to allow for an efficient collaborative authoring process. Generally, all different contributions types (section 4.1.5) should be organised and accessed by their type and associated characteristics (like author, date of submission, status). More importantly it should be possible to browse through the hypertext network formed by the contributions and the explicit links between them (see section 4.1.6 and Table 1). Outside these explicit links it should be possible to search for particular words or sentences and to find similar contributions using the statistical techniques mentioned in section 3.4.2. Requests for documents and “pending” contributions waiting for the necessary support to become “accepted” should be easily noticed, as they are the starting points to build the community knowledge base. Besides this common information, every contributor should have access to his/her “participant specific working area” where information is available about his/her contributions, unanswered questions and details regarding collaborative authoring processes such as contributions waiting for the reciprocal “merge” link to initiate the process.

### **4.4. Preparing and submitting a new contribution**

Easy access to all existing information, as described in the previous section, is particularly useful when preparing a new contribution for submission, since at that time it is necessary to find similar contributions, relevant documents or related ontology items. The next sections will detail how new contributions are prepared and submitted.

#### **4.4.1 Text items**

The content itself must be truly innovative, meaning that it should not already be expressed in previous contributions. Otherwise, it would be better to simply support them. From all identified related contributions, the participant must choose the ones he/she considers suitable to join with and propose “merge” links to them. These links could be qualified, that is, the author may indicate exactly how he/she proposes the merging of the two contributions.

The participant must also be sure that all data (such as statistics and figures) or documents

mentioned in the contribution are already available to discuss. It is his/her responsibility to define the correct “support” links between the new contribution and those support documents. If some documents are missing, it is better to submit them before submitting the contribution or issue a “request for document”.

The participant should take into account that the used terminology is as much as possible in accordance with the current ontology, making it easier to understand and to find similar contributions. Then he/she must choose the right keywords from the ontology that will afterwards be used to establish the relation between the ontology items and the text items.

#### **4.4.2 Documents**

Documents may be submitted either in response to a “request for document” or to support a text contribution. Documents produced by associated official entities should be preferably submitted by those entities since they can then guarantee their authenticity. In this case, these contributions will not be subjected to the subscription mechanism and the facilitator, who will also be responsible to choose the correct keywords from the ontology, may conduct the submission process. Documents from other official entities may be submitted by any participant or by the facilitator although in the first case they have to be subjected to the subscription mechanism.

It is possible that conflicting documents may be submitted by participants and may even gain enough support to become accepted. In these cases it is up to the facilitator to determine which document is to be considered.

#### **4.4.3 Ontology items**

Collaboratively defining an ontology, a common language to be used among those participating in a discussion, is one of the goals of the public participation process. This ontology is composed of terms, definitions and relations between them. Any participant may submit a new term and the corresponding definition, especially if he/she wants to use it as a keyword for a text item, document or request for document. Only the definitions will have to gain enough support from other participants before being accepted. This way alternative definitions may be submitted for the same term and the definition with most support (after a limited time period) is the one accepted. As to the relations between ontology items, they will be created and updated using the indexing statistical techniques mentioned in section 3.4.2 that are applied to all submitted text items, documents and ontology item definitions.

Independently of the contribution type, and even if the process admits only anonymous contributions, the author may choose to provide a context to his/her contribution, that is, to present his/her expert or stakeholder conditions as defined during the registration process.

#### **4.5. Subscribing a contribution from another author**

The first objective of the subscription mechanism is to limit the expected information overload in a public participation process by insuring the relevance of accepted contributions (text items, documents or ontology items) and reducing redundant ones. Once they are submitted, all contributions get an initial status “pending” and become available for subscription. Different types of contributions may have different subscription threshold values and different subscription time intervals. During that time, participants are expected to subscribe those contributions that they find relevant, instead of submitting similar contributions. Once a contribution gets enough support it gets the status “accepted” and becomes part of the community knowledge base.

Since every participant must register first, it is possible to ensure that he/she subscribes only once each contribution and may withdraw his/her subscription at any time.

#### **4.6. Collaborative authoring of text item contributions**

Simply collecting and organising contributions in a public participation process does not fully reflect the iterative process we aim to achieve. The goal is that, through informed discussion, the views and opinions of the participants evolve and it is possible to find common opinions among them, which will constitute new contributions. This does not mean that the goal of such a public participation process is to produce a consensus document that reflects everyone’s opinions. But we can look to subscriptions and “merge” relations between text items and begin a convergence process that will lead, hopefully, to a reduced set of text items, each one subscribed by as many participants as possible, and reflecting all different views and opinions.

This whole convergent process is based on pair wise attempts to merge text items. The starting point to merge two contributions is the fact that there is a two-way “merge” relation between them. This means that both authors are convinced that the policies, actions, viewpoints expressed in the separate text items are suitable to be presented in a single text item. Once two such contributions are identified, the next step is to engage both authors in producing a unified contribution in a synchronous or asynchronous process. If they manage to write it, thus agreeing it reflects both previous contributions, the unified contribution will get status “accepted” and inherit all subscribers from both original text items (since they agreed to merge both contributions). Besides agreeing on the final text item, both authors must also agree on the new outbound “merge” relations thus allowing the collaborative authoring process to proceed. Regarding the “inbound” relations, since they depend on other authors, it seems logical that only the common ones remain. To be compatible with any other text item and to allow for future merging processes, it is necessary that the unified text item will have only one author (the oldest text item author). The other author will be regarded as co-author (see section 4.1.8) of the unified contribution. The original text items will get the status “merged” as explained in section 4.1.7. Further along the process if one of the co-authors disagrees with the merge result he/she is allowed to recover the original contribution. The

recovered item will get the status “pending” and will have to pass through the subscription process again. It is also possible that along the public participation process the author of a unified contribution withdraws and delegates in one of the co-authors the responsibility to conduct further merging processes.

## 5. Public participation support system architecture

To support public participation processes like the one described in the previous section, we propose to use a system whose architecture is depicted in Figure 1 below. This figure presents the main components and functions that such a system must have, which will be described in the following sections without referring to implementation details.

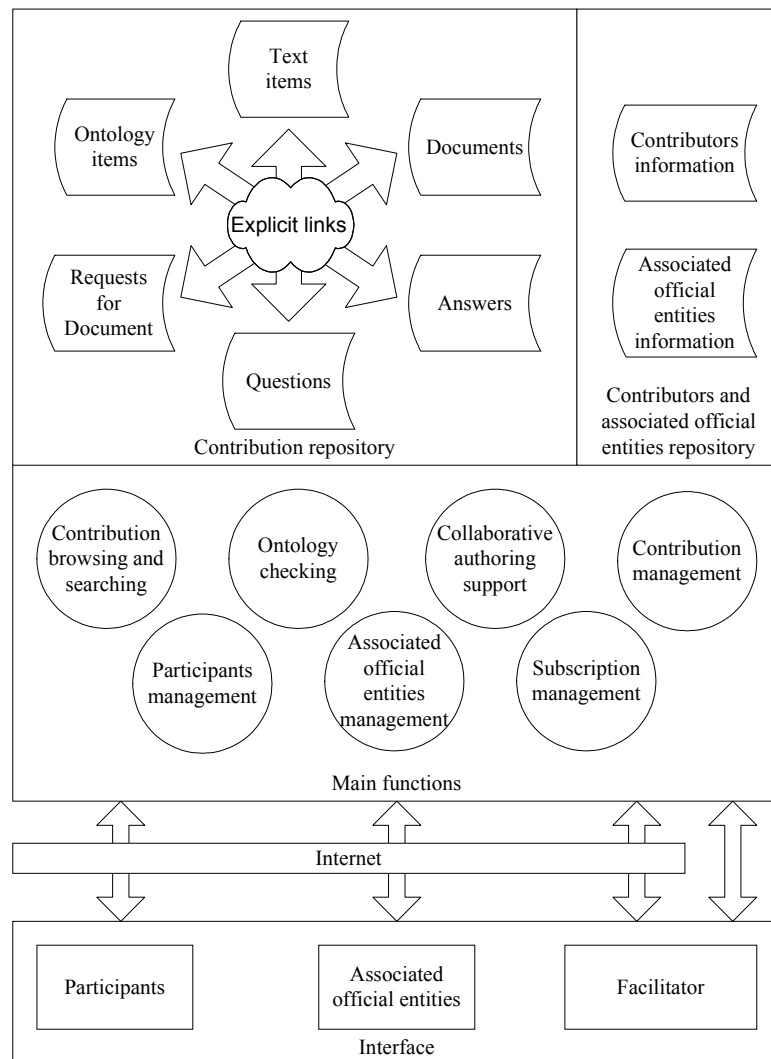


Figure 1. Architecture of a public participation support system.

### 5.1. Contribution repository

A major component of the public participation support system is the contribution repository, which stores all contributions and respective explicit links between them, thus constituting the core of the community knowledge base. It must be organised in such a way that facilitates retrieving,

searching and browsing operations.

## **5.2. Contributors and associated official entities repository**

The system must maintain information about the registered contributors and the associated official entities. Regarding the contributors, this information is necessary to ensure security and access rights, to relate anonymous contributions to their respective authors and to establish contribution context information (expertise and/or stakeholder condition, see section 4.1.4). Also, the information is essential to implement the subscribing mechanism and the collaborative authoring process, and to allow each author to answer any questions regarding his/her contributions. Knowing the specific interests of each contributor, expressed through previous contributions submitted and/or consulted, may also be useful to establish contributors' specific working areas where the information from the repository is presented according to its relevance.

Associated official entities information is maintained to establish communication channels that allow them to answer any questions addressed by the participants.

## **5.3. Main functions**

Several functions may be identified within the system and will be presented in the next sections.

### ***Participants management***

This function is responsible for the participants' registration process and for the control of the access to the system. Also, all information relevant to manage the participants' specific working areas is maintained up to date.

### ***Associated official entities management***

The main role of associated official entities within the public participation process is to provide answers to any questions the participants might have and documents to any pending requests. This should require as less as possible intervention from the facilitator and therefore it is necessary to manage communication channels (e.g. electronic mail and file transfer protocols) between the official entities and the process.

### ***Contribution management***

This is a core function within the system. All submitted contributions and relations between them must be organised and stored. Depending on the type of contribution, information about each contribution may include its status, the identification of its author, co-authors, supporters and presenters, and the chosen ontology keywords. All this information is updated as a result of the supporting mechanism and collaborative authoring process. In the case of text item contributions, links between them may include qualifying information about how the process of collaborative authoring should proceed.

### ***Subscription management***

The subscription mechanism is a central piece of the whole system, since it helps reducing the information overload by filtering non-significant contributions and avoiding redundant ones. Every type of contribution may have a different subscription threshold and a different subscription time frame, and it is necessary to control, for each contribution, whether or not it has received enough support to be “accepted”. It is necessary to ensure that each participant subscribes each contribution only once and may withdraw his/her support at any time.

### ***Collaborative authoring support***

A major goal of the public participation process is to support participants engaged in collaborative authoring of documents containing common views, opinions and options. To begin with, it is necessary to monitor individual text item contributions and their explicit “merge” relations to detect which contributions may be joined. Once two contributions are ready to be merged, it is necessary to notify the corresponding authors and to provide them the necessary infrastructure so that they may engage in both synchronous and asynchronous collaborative writing of the joined contribution. This may include tools such as electronic mail, chat rooms or whiteboards. Once the collaborative task successfully ends, it is necessary to change the contribution repository in accordance.

### ***Ontology checking***

The purpose of ontology checking is to “guide” the participant as he/she prepares (writes) his/her contribution by analysing it and suggesting the use of a terminology that is common to most of the other contributions, preferably using the ontology items already accepted.

### ***Contribution browsing and searching***

Informed participation is a key element of the public participation process. Therefore, the system should allow browsing through the information repository considering the different skills and preferences of the participants (including the observers). This includes “navigating” through the hypertext network of contributions and explicit links, and taking advantage of the implicit links provided by indexing techniques that unveil similarities between contributions. These techniques are also important to aid the participants on identifying related contributions already submitted. This potentially avoids the redundancy of contributions if the participant chooses to support a previous contribution instead of submitting a new one, or if he/she solely focus on those aspects not covered by existing contributions. Also, it may reveal opposite contributions that the participant may want to address.

## **5.4. Interface**

The interface component of the public participation support system is an essential feature to ensure maximum availability and usability to all potential participants (citizens). The first concern

about the interface component is that it should be easily available. Since the Internet is the chosen communication infrastructure, it is only natural that Web browsers will be the key interface component. They have the advantage of being already installed in almost every computer and everyone knows how to work with it. When designing the interface it is necessary to take into account that it is to be used by a large number of participants, with very different skills. Its major challenge is to present a huge quantity of information in a perceptible and organised way. To address this problem every participant has his/her own specific working area, where information is presented according to its relevance to that participant. This may include information about his/her own contributions, ongoing collaborative authoring process or unanswered questions. As to the other contributions, they may be organised according to the relevance they have for a particular participant taking into account his/her previous topics of interest.

## **6. Final remarks**

We are confronted with public official decisions that affect our quality of life, particularly in a local context. These public official entities act as our representatives and therefore we do not question their legitimacy to make those decisions. However, there has been for a long time the desire to be better informed about those decisions and even to have a more direct influence on them. The main problem is how to let thousands of citizens participate in a coordinated and effective way in those decisions. The risk is to engage in pseudo participation initiatives like surveys and opinion polls where we are confronted with a set of pre-determined options and don't have sufficient information to make conscientious decisions. Any process of public participation must be based on informed discussion, must allow the presentation of as much as possible different opinions and options, and must allow having real influence on the outcome of the decision process. This real influence depends not so much on the process itself but on the intentions and characteristics of the sponsor.

This paper reviews some of the most important concepts regarding public participation and presents our understanding of a public participation process for local policy issues. Such a process is aimed at promoting informed discussion among citizens and identifying common opinions, views and options. We analysed the requirements of these processes and proposed a way to organise them. We began by identifying those intervening in the process: the sponsor (responsible for starting it and providing the necessary resources), the facilitator (responsible for conducting the process, explaining it to the participants and helping to perform some of its tasks), associated official entities (providing answers and official documents) and the participants themselves (simply observers or really involved contributors). Then we distinguished between the different types of contributions, including the possible links between them. The process itself is essentially based on three key points. First, the necessary official documents should accompany all contributions so that they become easier to understand, discuss and evaluate. Second, participants are expected to

subscribe (support) other participants' contributions instead of submitting redundant contributions and, at the same time, validating them as far as the interest they have for the public participation process. Finally, authors are encouraged to join their contributions, engaging themselves in collaborative authoring. The aim is to reduce the number of final contributions, providing that they represent all different points of view, opinions and suggested actions. Some proposals made for the organisation of the public participation process may be adjusted due to the specificity of the process and/or due to real experience.

Then we looked into the crucial aspect of how to support such processes. It is our conviction the recent developments in ICTs are making it possible. As the Internet and WWW are becoming increasingly available and the computer literacy is spreading among common citizens, a suitable communication infrastructure exists to allow the participation of thousands of interested citizens. Research areas such as Group Support Systems and Geographical Information Systems provide adequate techniques. Having these in mind, we laid out the main components and functions of a system design to support public participation. It is our conviction that the necessary conditions exist to support public participation processes in local policy issues.

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