A configurable architecture for *e*-Participatory budgeting support

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Abstract Participatory budgets are emerging as a paradigm for participation. However, there are many variants of such experiences. Moreover there is a little use of ICT in this context. We present a configurable architecture for e-participatory budget formation support.

1   Introduction

Since the 1960's, an increasing apathy and feeling of alienation among citizens, has led to the so-called *democratic deficit* (Steffek et al, 2008), which has entailed an increasing interest in promoting participatory processes, which allow citizens to take part in public policy decision making. Participatory processes are on a clear rise for reasons including: increase of legitimacy, acceptance and transparency in decisions made; approaching decisions to citizens; taking advantage of the local knowledge that citizens might have; educate politicians, remembering them that they are elected to represent citizens and mitigate clientelism; educate citizens to make them understand that decisions entail both benefits and costs that need to be somehow balanced; enhance diversity, including additional perspectives on a problem; and, reduce the apathy which causes the above mentioned democratic deficit.

A reference example of participatory budgets (PBs) which allow citizens to take part in making decisions of how part of public budget is spent. There are many variants of PBs, as described in Alfaro et al (2009). Indeed, in this paper we shall show three examples from Salford, Porto Alegre and Getafe. Another important issue is that little technology has been used in all experiences that we have analyzed. This leads to describe a generic configurable architecture for e-Participatory budgeting support.

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2   Participatory Budgets

Participatory budgets (PBs) are emerging as a paradigm for participation, specially at local level, see Sintomer et al (2008). They constitute an attempt to allow citizens to have a word on the decision of how part of a public budget is spent, mainly in municipalities. It is a budget allocation approach based on dialogue and citizen participation, which diverges from the current predominant representative model. In a sense, PBs are transforming the idea of a representative democracy, in which the citizen's input is considered just at the moment of elections, to move closer to a participatory democracy, based on direct participation and debate.

Early experiences with participatory budgeting took place in Kerala, Lajes, Boa Esperança, Diadema and Vila Velha. However, the most well known, and longest lasting PB experience comes from Porto Alegre, in Brazil (initiated in 1989, permanently adopted in 1992), acclaimed for both the efficient and the highly democratic management of urban resources it has made possible. PBs are becoming increasingly popular in many other places, all around the world. Recent reports indicate that more than one hundred municipalities in Europe, covering more than four millions citizens are implementing these PB processes, see Sintomer et al (2008). The announcement of the UK government in year 2006 that all municipalities should implement PB experiences by 2012 is symptomatic in this respect, see Röcke (2008). The PBs have appeared not only in Europe, but also in other countries including China, the Dominican Republic, Ecuador, India, Indonesia, Mexico, Serbia, South Africa, and Uruguay

There are many variants of PBs. In some cases, thus consist, only, of an informative event, so that citizens do not participate directly in decision making. In other cases, PBs entail an intensive participation procedure, using, for instance, voting or negotiation sessions. At an illustration, we briefly describe three experiences with different participation mechanisms.

- In **Salford,** United Kingdom**,** the first PB experience was promoted by the Labor government with the support of Community Pride, see (Sintomer, 2004). The process begins with consultation meetings in which all citizens are invited to present their proposals on issues such as the budget, the quality of public services, taxes ... The citizens may also send their proposals by post or online. When the meetings finish, the City Council has to decide how to spend the budget using a resource distribution matrix: it mediates, through weightings and indicators, between the needs expressed by citizens and the needs of an area. Thus, even if citizens do not participate directly in decision making, their views should influence the final result.

- In **Porto Alegre,** southern Brazil, in 1988 the new government tried different ways to provide more power to the citizens and change the priorities in public expenditure, approaching them to the less privileged classes. In this context, the first PB experiments took place in 1989, as a new way of elaborating the municipal budget. Participation in Porto Alegre is organized through seventeen regions, defined according to geographic, social and

community criteria. Every year, all citizens are invited to participate at the PBs. In the beginning, citizens receive basic information about the city budget in meetings at district level and delegates selected from the people attending these meetings drew up a list of priorities for projects in the forthcoming budget. The next step is to vote on assigning priorities to projects, and elect two delegates from each district. The investment resources are distributed among regions and thematic categories using a two step procedure which generates a budget matrix. In the first step, the available budget is distributed among thematic categories, and citizens vote, in regional assemblies, on thematic priorities. When this step is finished, the available budget is distributed among the thematic categories proportionally to the total points received. In a second step, the budget allocated to each specific thematic category is distributed among the seventeen regions according to a formula combining three criteria: the total population, the lack of services or infrastructures and the thematic priority that has been given by citizens in each region. At the end of the process, the Investment Plan is subject to approval by the Municipal Council of the Government Plan and Budget.

- In **Getafe**, Spain, participatory budget processes have been gradually evolving since 2003. Opportunities for participation are broadly announced in different media: the council monthly newspaper, the council website, local press, radio, leaflets and posters. An important strategy is also the involvement of local intermediaries (schools, citizen associations, youth and sport centers, etc.) in the recruitment process, which are intended to activate under-represented citizen groups (youth, elderly, socially disadvantaged …). At the beginning, citizens can submit proposals by post, at locally held neighborhood meetings or online. Proposals sent by post are, then, presented at meetings and on an internet platform for further discussion. At the end of each meeting participants can express their preferences by voting. To do so, every participant must rank their favorite three proposals in order of preference, giving three points to their most preferred, two to their second preference, and one to their third one. When the voting finishes, the technical staff examines the five most voted proposals to determine its technical, economic and legal feasibility. Finally, the final list of proposals is then forwarded to the borough assembly for final decision making. In this phase, citizens are invited to take part in the public debates of the technical committees at the borough assembly.

3   A general approach

Through the analysis of the several experiences and the tasks included, around the world, we have identified standard activities which appear in various PB applications, which schedule them in various ways. These are:

1- **Problem Structuring.** The problem is structured before a final list of proposals is identified. At this stage technicians must establish what is the budget available for new project. For this, they must subtract the committed expenditure and the investment and the expenditure of multi-year projects approved in previous years of the total budget. When they have calculated the available budget for the year, they must study which are the investment and the expenditure of each project, this include the committed expenditure and investment for the next years, because this could change the participatory budgets of the next years. Whit this data the technicians elaborate an initial list of projects and determine the criteria for choosing among the proposed projects. In this phase, it also takes place the participant recruitment with the process broadly announced in different media: council's monthly newspaper, council's website, local press, radio, etc.

2- **Debating.** Participants can express their opinions and discuss a list of projects. They also propose new projects and criteria, possibly supervised by a decision analyst, to consolidate a final list of proposals. The technicians must include the new projects and criteria in their analysis, to know which are the expenditure and investment of these new projects, as this may affect the budget of the year and in the next years.

3- **Preference Modelling.** Participants analyze the allocation problem individually and determine their personal preferences which are used to evaluate feasible budgets as well as obtain their preferred budget

4- **Negotiation**. Participants are allowed to make offers proposing in which projects to spend the budget and discuss them through a forum. Participants can accept or reject each proposed offer. Individuals are supported in the construction of offers and the evaluation of received offers using decision analytical tools. Furthermore, several negotiation methods could be used, such as POSTING or balanced increment method (Rios and Rios Insua, 2008).

5- **Voting**. Usually, participants express their budget priorities or choose their representatives through voting sessions. To do so, several voting schemes could be used, such as approval voting, Borda Count, majority rule or cumulative voting.

6- **Arbitrating**. In case, the winning budgets were dominated, there are a referee who solves the conflict, trying to incorporate some principle of equity and fairness.

7- **Sampling.** A representative group of society is selected to take part in decision making process.

We distinguish three basic user profiles:

- The authority, is the entity which aims at solving a participatory budget problem, structures and publishes it.

- The citizen, who provides input to the participatory budget decision process, that is, his opinions and preferences about which projects to include in the budget.
- The technical staff, who take technical care of the process development: supporting the problem owner structuring the problem, and provide assistance to citizens in the rest of the phases, the professional assistance must be neutral without changing citizen's preferences, but should make clear the budget constraints.

We present below how these phases have been combined in the cases described in Section 2. Furthermore, we provide a general schema to implement the Participatory Budget processes:
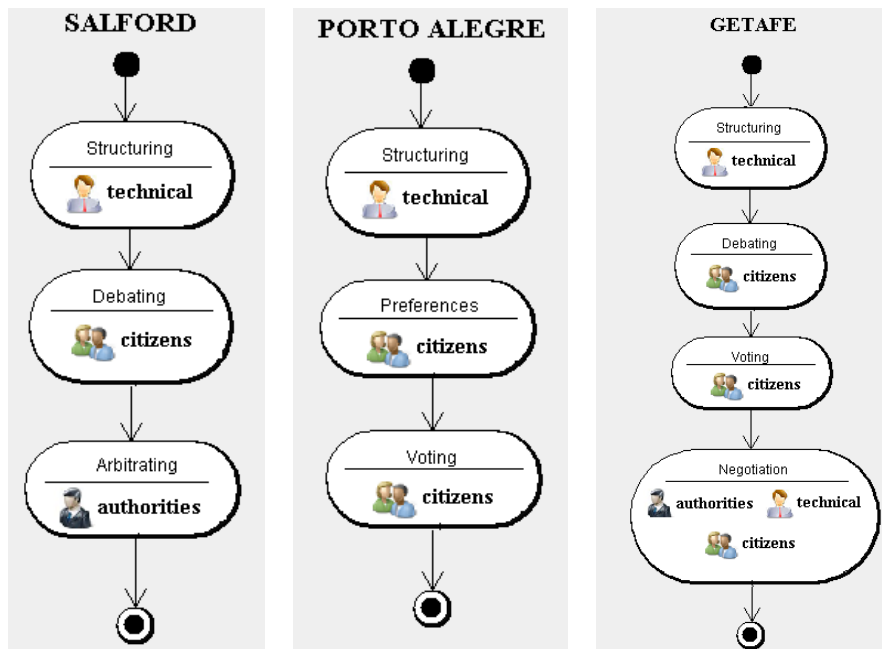

Figure 3.1: PBs Schemas of Saldford, Porto Alegre and Getafe.

Finally, we should emphasize that, from an ICT point of view, except for a few experiences which use discussion fora to collect electronically suggestions for project proposals as well as votes, there is little use of ICT: they are based on physical meetings, with preferences established through voting, very frequently by raising hands in public meetings. From the point of view of the little decision technology employed, no formal modeling of citizen preferences is undertaken and no use of negotiation or group decision support tools is used. To sum up, little decision support methodology is used. Therefore, we propose, in the next section, a configurable architecture for e-participatory budget formation support.
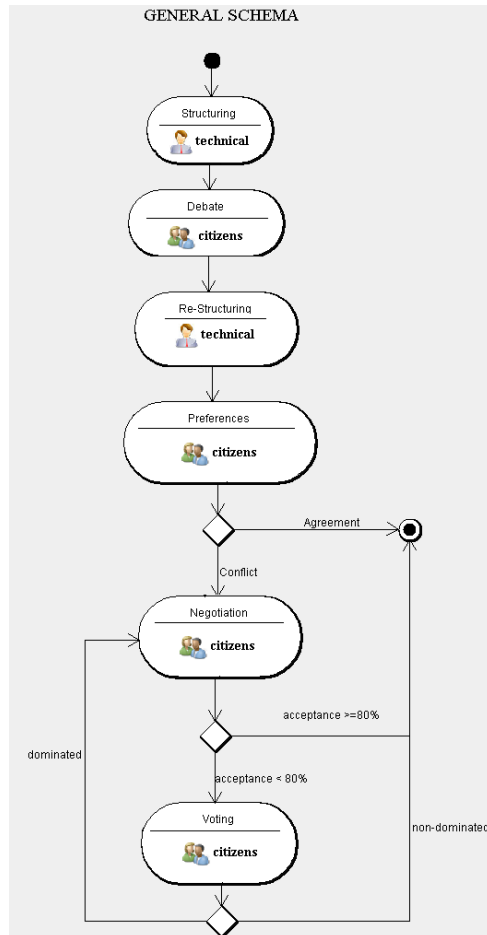
Figure 3.2: General Schema of Participatory Budget.

4   A generic architecture

We describe now a configurable architecture, which implements the methodology described before. The goal of our architecture is to provide a technological platform with innovative tools and techniques facilitating electronic participation services, and encouraging the use of ICT, possibly increasing citizen satisfaction, as well as transparency in the budget decision making process.

Our architecture is generic in that it allows deleting or repeating stages to adapt the system to each specific participatory budget process. We describe now our architecture, divided into modules, see Figure 4.1, which support each of the phases described in section 3.
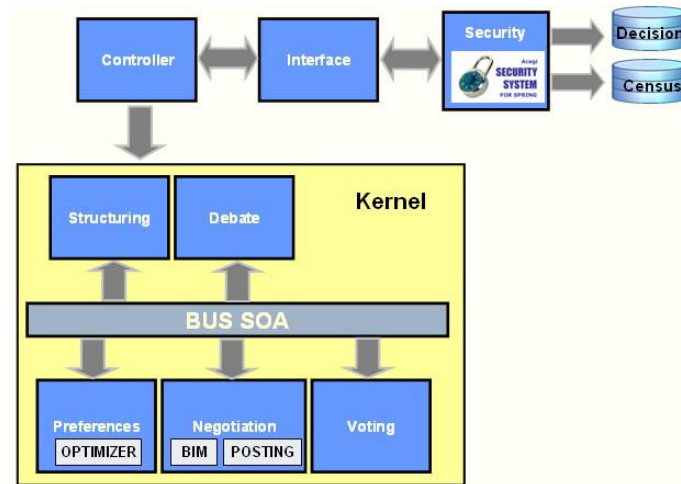
Figure 4.1: Architecture

The architecture guides the administrator on behalf of the problem owner and the participants in the participatory budget elaboration process, following a protocol, based on the phases that we have mentioned. At any time, the action that each agent may carry out will depend on his previous action on the system and the actions of the rest of agents. As an example, none of the participants may communicate his preferences to the system until the administrator has finished the budget preparation phase The budget preparation phase must include the recommendations of the technicians about the budget, the available projects with their expenditure and their investment. The process status at any moment is defined based on the actions carried out by the agents until that moment.

The architecture has been implemented with Java/J2EE, Open Source, see (Weber, 2004), development technologies (Spring, JSF, Hibernate, Acegi, Maven, Subversion, etc.). From the web technologies point of view, our architecture has been configured as Service Oriented Architecture (SOA). Thus, it is possible to adopt the Software As a Service (SaaS) philosophy, eliminating the need to install and run the application on the customer's own computer because the application can be hosted as a service provided to customers across the Internet. SaaS can also conceivably reduce the up-front expense of software purchases, through less costly, on-demand pricing. Furthermore, the architecture intends to take a further step in the evolution of Web 2.0, because with it the citizens not only can communicate with others, or express their views, through social networks, blogs,... but also they will have the opportunity to participate and decide, to enhance transparency in decision making and, possibly, increase their satisfaction.

A relational database management system enables to store and manage information concerning the participatory budget elaboration process. Another database contains the information of all participants, their roles, their permissions, etc,… Furthermore, the system has a web based user's interface. To facilitate its use and

mitigate the digital divide, the interface is graphical and simple. It meets all conditions and satisfy the accessibility standards to make Web content accessible to people with disabilities. The controller is responsible for leading the process during all phases. It changes information between the different modules of the architecture, and interact with the interface.

Finally, we include a security module, which is responsible for verifying that users are registered in the application. To login into the system, the users must authenticate themselves using a private password. This module, also, verifies that the user is in the database and has permission to participate. Then, the system assigns the role that the participant plays and what that user can do within the system, depending on his role.

5   Discussion

The architecture described is a web-services intermediary system aimed at supporting groups in the elaboration of a budget. Rather than using physical meetings with voting mechanisms, we promote through on architecture virtual meetings in which participants can extend the set of alternatives and explore the budget consequences. The architecture supports negotiation methods such as POSTING, and the balanced increment method (BIM), but other multilateral negotiation methods could be implemented. If negotiations end up without an agreement, the voting module can be used to decide the budget.

The architecture illustrates how we might support groups to make decisions using ICT and decision technologies in the area of participatory budgets. Rather than using new technologies to facilitate standard political decision making mechanisms, which would allow for more participation, a more informed and transparent decision, and, even, a more consensual approach to transform current democratic processes.

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