

# **ELECTRONIC PARTICIPATORY BUDGETING: SUPPORTING COMMUNITY DELIBERATION AND DECISION-MAKING WITH ONLINE TOOLS**

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## **ABSTRACT**

Participatory budgeting is a relatively new movement in public administration to involve citizens in civic decision-making. Electronic participatory budgeting can lower opportunity costs and engage more citizens in public budgeting. Drawing from research on participatory budgeting in particular and public administration, public policy, and information systems in general, this research establishes two normative frameworks: one to justify adopting participatory budgeting philosophically and practically, the other to justify supporting participatory budgeting with online decision support tools. This research then offers practical design guidelines, exemplified by a prototype designed for a participatory budgeting process in a small rural American town. The research concludes with recommendations for evaluations and enhancements of electronic participatory budgeting.

## **INTRODUCTION**

Asking an advocate of democracy to justify citizen participation in public policy is like asking a geometer to defend the claim that any two points may be connected by a straight line. To the democrat, citizen participation is axiomatically good, the *sine qua non* of the revolution.

Citizen participation is also hard work for citizens and public officials alike. Participatory budgeting projects in Brazil and elsewhere demonstrate the time- and resource-intensivity of efforts to involve citizens in public decision-making. Citizens must educate themselves about complicated budget issues. Citizens and public officials must attend public fora and navigate the challenging dynamics of large-group discussions. Participatory budgeting may require thousands of person-hours of deliberation and decision-making that, from a Madisonian or a technocratic perspective, could be handled as effectively and more efficiently by a few experts insulated from political pressure and public distraction.

Contrary to the technocratic school of thought, participatory budgeting and similar efforts to engage citizens in governing their communities are more than pleasant yet inefficient democratic games. Public budgeting is one of the most important decision-making processes with the most widespread impact on citizens' lives. Involving citizens in that process strengthens a community in moral and practical ways. The benefits of citizen participation are sufficiently great that the proper response to the relatively high cost of participation is not to minimize participation but to minimize cost through the best methods and technology available.

Information systems research can offer great assistance to public administrators and civil society organizations who would implement participatory budgeting programs. However, designers of such systems should be able to explain not only *how* but *why* such systems should be developed and implemented. This research seeks to provide just such a normative and descriptive bases for designing electronic participatory budgeting systems. Following a review of the recent history of participatory

budgeting and tools used to support that decision-making process, this research addresses three tasks to promote electronic participatory budgeting (ePB). First, this research draws on the disciplines of political science and public administration to construct a justification for participatory budgeting. Once this justification is established, this research turns to the experience of participatory budgeting communities and the discipline of information systems and decision support to justify electronic participatory budgeting as a way to overcome costs that may stand in the way of adopting and sustaining participatory budgeting. Finally, this research offers practical design guidelines for ePB systems, including a description of a prototype local ePB tool that embodies these guidelines and offers decision support to citizens and public officials alike.

## **PARTICIPATORY BUDGETING: PRINCIPLES AND PRACTICE**

The basic problem in public budgeting is creating a budget that reflects the needs and desires of the community while operating within fiscal realities. This is a largely unstructured problem: while public budgeting may include specific quantifiable goals such as a balanced budget, defining those goals is a product of debate and compromise among elected officials and citizens with sometimes differing opinions and objectives. Even agreed-upon quantifiable goals may change with, for instance, different economic circumstances and new political leadership.

As the cooperative paradigm of public administration [19] would suggest, public budgeting is not necessarily an exercise in political competition. Every community, even a small one, will have factions with opposing views, but communities can also find a great deal of common ground. Community members generally share a desire to promote and strengthen their community. On many issues, like economic development and public safety, public budgeting may be less an exercise in crafting compromise to eke out a voting majority and more an exercise in community discussion to discover and synthesize varying and complementary views into spending decisions that reflect broadly shared vision and goals.

Participatory budgeting (PB) operates in this cooperative spirit. A relatively new movement in civic government, municipal participatory budgeting began in earnest with experiments in Porto Alegre, Brazil, in 1989 and other Brazilian municipalities in the early 1990s. It has since expanded to hundreds of cities worldwide, including small municipalities in South America and Europe with populations between 15,000 and 20,000 [8]. While prone to abuse and error (like any other political process—see discussions of declining participation due to political corruption in Porto Alegre in [2] and [18]), PB has been shown to enhance transparency, democracy, equity, education, and efficiency in various settings [3].

While four Canadian cities have experimented with participatory budgeting, the process has not gained a significant foothold in United States municipalities. The scarcity of PB here stems from relatively less social spending, overlapping authorities, and, most importantly, an inequitable property tax system that resists redistribution of resources to low-income areas that need more services than their tax base can support; however, successful participatory grant-making programs in the United States point to the potential for making broader PB efforts work within the American system [3]. One PB program in Washington, DC, has “significantly influenced” district budget priorities [26].

Some public service organizations have created online educational tools that, while not binding in any political process, give users a flavor of what participatory budgeting might feel like at the national and global level. American Public Media created Budget Hero, an online game in which users can select

policy options in a number of categories to see their impact on United States federal programs and the long-term national debt. The game was designed to spark a “national conversation” among “citizens, legislators, and policy makers” [1]. The Copenhagen Consensus Center designed an online tool for users to prioritize various policy approaches to global problems, including hunger, disease, terrorism, and air pollution [25].

## **GAPS IN CURRENT THEORY AND PRACTICE**

There exists a lack of well-developed theory “concerning extra-electoral citizen participation” [32, p. 1067]. One descriptive model [32] proposed to address this gap by explaining how various citizen participation mechanisms might develop assumes a game theory perspective in which participation is a power game between a government and citizenry in competition. This assumption fits with warnings that participatory mechanisms may draw a small cadre of citizens who seek to game the system to serve their own interests [6]. This framework also assumes that veteran public officials would tend to choose methods of engaging the public that minimize citizens’ roles in agenda-setting and decision-making.

Problematically, this assumption ignores the cooperative problem-solving goals of the public administration discipline [defined in 19]. Public administrators want to reach out to citizens and make them partners in governance; they need guidelines and tools that will help establish that civic partnership and promote community spirit that may check the political gamesmanship described by the game dynamic model in [32].

In practice, the literature on participatory budgeting makes infrequent mention of the role of information technology in supporting this civic activity. One survey [8] found 23 of 25 surveyed municipalities engaging in participatory budgeting also had websites, but there is no indication that those communities made systematic use of web tools to support PB in an integral fashion. PB projects tend to focus on face-to-face workshops and deliberation, with little effort to take advantage of or integrate with existing Web-based programs [17, pp. 56–58]. Modern information technology is certainly no pre-requisite to citizen participation: the ancient Athenians managed to govern themselves without the Internet, and modern democracy evolved in the West prior to the telephone and telegraph. However, various modern information technologies have shown their capacity for supporting citizen participation in, for example, the online organizing of activist groups and political campaigns.

Implementing participatory budgeting with online decision support tools embodies the thinking of various researchers who place citizen participation at the pinnacle of the evolutionary stages of e-government, the use of information systems to support government [4] [10] [35]. E-government practitioners identify using information systems to provide more and better information to citizens [28] and increase citizen participation in policy-making [16] as key goals for local and larger governments. Unfortunately, most governments have yet to rise to that pinnacle and put their e-government systems to their fullest use in treating citizens as equal partners in running their communities. Participatory budgeting is a logical field where progress may be made toward this goal. As information systems have enhanced performance in other fields, information systems designers can also extend their support to public administrators and civil society organizations who seek new tools to promote citizen participation in public decision-making activities like participatory budgeting.

## **RATIONALE: JUSTIFICATION FOR CITIZEN PARTICIPATION**

Not everyone embraces direct citizen participation in public decision-making. American democracy is by design a far cry from pure and perpetual plebiscite. The drafters of the United States Constitution implemented popular voting for just two offices, the House of Representatives and the Presidential Electors. The Constitution establishes a right to citizen participation in legal judgment of guilt or innocence, but it also insulates the highest judges from popular election or recall. The Constitution itself was created not in a series of inclusive town hall meetings but by a few dozen delegates meeting in secret. American government, often regarded in theory as the epitome of citizen enfranchisement and participation, reflects the Founding Fathers' fears that the *demos* was too unruly to manage the complicated affairs of state.

Similar concerns motivated the technocratic, service-delivery perspective of government in the 1960s and 1970s [23, p. 128]. Exclusionary technocracy became increasingly popular among public administration experts through the early 1990s: citizens lacked the expertise (said experts) to confront more complex modern problems of governance, and specially trained policymakers needed insulation from popular pressure that might cloud well-grounded decisions and mitigate against necessary but difficult choices [7, p. 655].

Participatory budgeting arose in Brazil in part as a response to the technocratic movement. The theory and practice of participatory budgeting offer several points of moral and practical justification for inviting citizens to the very center of the public decision-making process.

### **Legitimacy**

Citizens often view with suspicion policies that emanate from a single political executive or a small committee. Legislators voice the same suspicion of bills crafted entirely by the majority party without consultation with minority party members. A policy that results from an open, inclusive process bears at least a sheen of greater legitimacy, as participants can speak with direct knowledge of the conditions that brought forth that policy. Involvement of citizens in civic decision-making also recognizes a concept that has grown over the past several centuries: that as access to information and education grow and become more necessary to daily household survival in an interconnected world, the general public has both the capacity and the right to exert its rationality in governing civic affairs [21].

### **Stakeholder Buy-in**

Students of project management understand that involving stakeholders is crucial to project success. Keeping stakeholders informed of project progress increases stakeholder satisfaction. Involving stakeholders materially in the project increases their stake and thus the likelihood of their continued support. Public budgeting is a fundamental government project, with every citizen a stakeholder as taxpayer, beneficiary, agent, perhaps all three (e.g., the construction worker who pays taxes, fixes potholes, and drives to work on those repaired streets). Involving citizens in budgeting and being able to say to them at the end, "All right, here's the budget you've helped design" inclines them to think of the budget as their own. The personal investment they've made in that budget will incline them to support and defend that budget and future policy decisions that may be required to carry out that budget.

### **Property Rights**

"It's our money"—that simple statement captures the basic idea that property, ownership of an item, includes authority over that item. Public dollars, like public libraries and parks and other resources, are

the property of all citizens. No one citizen may claim unique authority over them. Participatory budgeting recognizes and gives voice to the proper collective authority citizens should be able to voice over their public treasury.

## **Trust**

At the heart of democracy is the idea that the government is *us*. Democracy does not work (and arguably does not exist) if citizens feel distanced from, mistrustful of, or otherwise separate from their government. Increasing interaction between citizens and public officials can build trust and replace the perception of government as *other* with the perception of government as *us* [5]. Even there, participatory budgeting done wrong—e.g., manipulated by government officials to give their pre-determined policies false legitimacy, or not opened equally to all groups of citizens—can erode trust, leaving citizens feeling disempowered and more hostile toward their government [22]. The interaction between citizens and public officials must thus be authentic, respectful, and purposeful for all involved.

One may also argue that sustained participatory budgeting exercises will build trust among community members as well. The Irish National Economic and Social Council is a long-standing corporatist public budgeting program, engaging representatives of specific institutions and groups rather than inviting participation from citizens at large. Council members find their annual efforts shaped by the “shadow of the future,” the knowledge that they must face each other again, not just as fellow citizens, but as fellow participants in the process next year when they return to the same discussion table [7]. The resulting interpersonal trust can promote reciprocity, communication, and flow of trustworthy information [36, p. 4]. If participation in a national-level budgeting process can forge stronger bonds among institutional representatives, local participatory budgeting can forge similar trust and shared civic spirit among independent citizens.

## **Competition in the Marketplace of Ideas.**

Acknowledging the reality of competition, even within the hopeful cooperativist framework of public administration, political choices are similar to economic choices. “Voters, like consumers, choose between the policies of competing political entrepreneurs” [30, p. 466]. Citizens and public officials alike face that choice. If a handful of professional politicians and lobbyists can monopolize that marketplace of political ideas, the quality of public decision-making will suffer from lack of competition. Participatory budgeting opens the door for more “small” political entrepreneurs to enter that marketplace, challenge the established players, and enhance the competition and choice that, by the magic of the marketplace, become a collective effort to serve the common good.

## **Better Systems**

Engaging current and future users in the design of a system can result in a better system. Various disciplines provide useful examples. A philosophical and practical case for participatory design can be made in information systems [27]. A participatory design process is more likely to uncover the needs of users and inform the formal designers of features that will produce a more satisfactory system. The participation of programmers in discussions of project assignments improving the programmers performance on complex tasks [9, in [24], p. 512]. An apt analogy can be made to participatory budgeting in management situations: broader participation requires managers to be more active in considering and evaluating budget alternatives [24]. The analogy to budgeting processes is useful: a public budget, after all, is an information system, designed to capture and translate citizen needs and

priorities into government spending and action. Involving citizens in that process will capture more accurate information and engage public officials—our “managers”—in a more extensive discussion of alternatives for acting on that information. Citizen participation thus contributes toward better fulfilling the purpose of the budget “system.”

### **Increased Public Resources**

Stronger legitimacy, stakeholder buy-in, and trust can lead to some practical policy benefits. When citizens participate in creating a budget, they are more likely to internalize the success or failure of budgeted projects. They are thus more inclined to support the success of those projects with their own resources. A survey of 25 municipalities using participatory budgeting in Latin America and Europe revealed a pattern of increased tax revenues and decreased delinquency [8, p. 36]. Respondents felt increased participation and transparency helped residents understand the process, limitations, and results of their municipal budgets. It would appear that participatory budgeting not only disinclines citizens from evading taxes but encourages them to support paying more taxes or to contribute other forms of capital (e.g., materials, volunteer time) toward municipal projects.

### **CITIZEN PARTICIPATION: HOW ONLINE DECISION SUPPORT TOOLS CAN HELP**

If citizens do not engage as political entrepreneurs in that marketplace of ideas, it is often because of the high cost of entry. Every hour attending a city commission meeting or searching through municipal receipts is an hour working folks could spend earning overtime pay or relaxing with family. Community governance in early America was “largely the province of economically better-off citizens with the time to devote to it” [5, p. 150]. Citizens have gained more opportunities for democratic participation over the last two centuries, but direct participation in politics has become more expensive [30, p. 466] and opportunity costs continue to restrict direct citizen participation in regular government affairs (see, for example, [11]).

Overcoming the opportunity costs that keep some citizens from participating in civic affairs could be achieved in various ways:

1. increasing citizens’ personal wealth;
2. increasing citizens’ motivation to participate;
3. decreasing the cost of participation.

The first option is beyond the scope of this discussion. The second is conceivable though challenging. The third offers perhaps the simplest and most direct way in which online decision support technology might promote citizen participation. Lowering the cost in time in effort that citizens must expend to participate is akin to leading thirsty horses to water: those who want to drink will gallop on in, once we clear the brush blocking their path. Lowering that cost may also induce some less “thirsty” citizens to try participation, at which point satisfying experiences may increase their motivation for deeper civic engagement.

One of the basic purposes of a decision support system is to lower the cost of making effective decisions. Decision support tools can lower opportunity costs and help participatory budgeting better fulfill its goals in several ways.

### **Broader Representation**

A common concern among participatory budgeting advocates is ensuring the representation of low-income residents. The poorest residents of a community are most challenged by high opportunity costs of participation and thus are at a disadvantage in making their voices heard in any civic process [7] [29]. A system that decreases the cost of participation improves the chances of bringing those underrepresented citizens to the table. The digital divide still presents a barrier to participation for some low-income citizens, but the increasing pervasiveness of the Internet makes an online system perhaps the most efficient way to open the door to more low-income citizens.

### **Social Auditing**

Good participatory budgeting requires not just conscientious, deliberative creation of a budget but also accountable administration and reporting of results. Participatory budgeting will frustrate citizens if the budget they work so hard to produce disappears into a bureaucratic black hole. Citizens need to see that the money their budgets allocate is indeed spent on the priorities they identify. Only then can they fully gauge the extent to which the tax dollars spent have produced good results. The process of social auditing [29, p. 207] puts government receipts and expenditures out in the open where thousands of eyes can review them for accuracy and propriety. Such data is already recorded electronically in most American governments; it is a small step to move that record-keeping online and make it accessible to citizens to inform their understanding of the budget and future decisions relating to it.

### **Transparency**

Closely connected with social auditing is the idea of transparency. Government decisions made in seclusion and secrecy degrade both citizen voice and public accountability [29, p. 231). Allowing citizens into governing processes where they can see what is happening and speak up about it increases their oversight of the government. As many politicians and public officials are realizing (as shown by projects like USASpending.gov, created by the Federal Funding Accountability and Transparency Act of 2006), the Internet is perhaps the fastest, cheapest route toward broad-reaching transparency in government operations.

### **Deliberation Within**

Participatory budgeting is a social decision-making process. However, Goodin [20] highlights the importance of “internal-reflective” deliberations, the discourse that happens within as individuals work out their own beliefs and opinions. If such internal deliberation is an important part of developing a better understanding to bring to community discussion, an online decision support system can offer support for that internal process as well. When communities place budget data, meeting minutes, and other relevant materials online, those data and documents are accessible to individuals at any time, wherever they have Internet access. Individuals may review such documents in the privacy of their own home, or at least a quiet library cubicle, and give them as much quiet consideration as they see fit, until they feel their internal deliberation is sufficiently informed and developed to bring opinions to a group meeting. Online applications can allow citizens to experiment with, evaluate, and formulate arguments for or against certain budget ideas before introducing them for public discussion.

Providing space for internal-reflective deliberations may serve as a check on informational and social pressures that can produce flawed results in public deliberation. Participatory budgeting generally presumes deliberative group judgments. Deliberative group judgments may tend toward “uniformity and

ensorship... without structural protections.” Statistical groups and information markets—both mathematical aggregations of individual, independently formed judgments—“will often lead to more accurate decisions” [33, p. 965]. This analysis of deliberative group judgments focuses on group processes addressing questions of fact, not questions of value, but informational and social pressures may apply all the more in deliberations of increasingly complicated issues like those inherent in forming a municipal budget. At the very least, we may analogize the factual information in the examples cited in [33] to the budget priorities held by each citizen: PB must first determine what individual citizens’ budgetary priorities *are* before attempting to deliberate toward a shared vision of what the community’s priorities *should be*. An online tool might help citizens build better initial individual judgments about community budget priorities. Such a tool could also gather citizen attitudes and priorities before any formal public discussions begin, providing citizens and elected officials a useful starting point for their group deliberations. Both uses could qualify as the “structural protections” urged for deliberative group judgments.

## **Education**

Several authors cite education as both a pre-requisite and a positive outcome of participatory budgeting [7] [22] [26]. Uninformed citizens may favor “overly simplistic solutions” that place short-term gain over broader general welfare [34, p. 149]. Effective participation requires an understanding of government finance, policy, and programs as well as the economic, social, and environmental conditions of the community. Helping citizens learn about the factors affecting their municipal budget (not to mention a new participatory deliberation process) takes time and resources. Establishing a user-friendly interactive community budgeting website may be the most efficient way to create a uniform program of civic education that can reach the maximum number of potential participants. Once citizens are equipped to participate in the budget process, that participation serves a continuing pedagogical purpose, as citizens learn from the process and from each other. An effective online decision support tool can help citizens capture and share with each other the knowledge they gain and create.

## **ELECTRONIC PARTICIPATORY BUDGETING: DESIGN PRINCIPLES**

The above justifications offer a normative basis for designing online tools to support participatory budgeting. From that basis, designers may address the practical issue of designing electronic participatory budgeting (ePB) tools.

### **General Web Design**

ePB designers may start with general guidelines for improving accessibility to budget office websites. For content, [34] recommends including factual information about past and present categorized revenues and expenditures to illustrate historical trends, coupled with budget projections assuming the maintenance of current policies. A good budget office website should also include proposed budget changes, economic indicators, descriptions of current programs and the budget process, metrics for policy success, and reports of citizen feedback [34]. These guidelines for presenting budget information cohere with basic Web design principles: keep information up to date, use clear graphics and other media to engage visitors and communicate effectively, provide data in alternative formats to increase accessibility, provide relevant links, and include user-friendly search and navigation features. If a budget website is hard to navigate or requires much training to use, the system loses the opportunity cost advantage that motivates the construction of the online tool.

Specific to budget websites, proposed budget changes should be presented consistently in the context of “pre- and post-policy amounts, in addition to indicating the amount of the change in percentages or in currency” [34, p. 172]. This specific detail illustrates a more general guideline: an ePB tool should make budget figures as clear as possible for participants who may be looking at the budget for the first time and thus need context to understand the many numbers involved.

### **Data Accessibility**

Accessibility of data is all the more important for participatory budgeting. A useful ePB website will offer easy and effective search tools to support citizen research. It will also offer budget data in formats that may be easily accessed and manipulated by users. A budget book scanned from paper and presented in PDF format is perhaps the least useful format in which such data could appear. Citizens who want to work with those numbers—perhaps create their own scratch sheet showing the impact of 3% increases in each program, or perhaps just check whether the numbers actually add up—must transcribe the numbers to their own calculator or spreadsheet. If budget numbers presented in spreadsheet or even HTML format, users can spend much less time copying the data (a simple cut and paste should be all it takes) and have more time to perform analyses of their choosing.

An example of this data accessibility is found on [Stimulus.Virginia.Gov](http://Stimulus.Virginia.Gov), an interactive website created by the Commonwealth of Virginia to solicit citizen proposals for the use of federal stimulus dollars. In 48 hours of operation, the website attracted nearly one thousand suggestions from citizens, business owners, civic organizations, and local government officials. The Reports page included an option to export the complete list of proposals as an Excel spreadsheet. With a click of that button, any citizen could turn that list from a static page of a thousand entries into an analyzable database. A citizen (or an interested lawmaker) could produce any number of informative calculations and custom lists: sort by cost to see how many small-scale projects could be completed; sort by date to create a list of “shovel-ready” projects; sort by location to create a list of projects targeted to low-income areas. Local ePB websites should help citizens engage with data in similar ways.

### **Background Materials**

Citizens have to understand the data and issues in the budget. They require clear explanations, context, and history. Wherever possible, budget data should include links to explanatory materials, with contact information for city officials who can offer more help if desired. The public officials responsible for the budget website must also establish themselves as providers of complete, neutral, and balanced information [26, p. 52] so citizens feel they can trust the materials presented. Administrators can bolster this authenticity by including citizen feedback and links to independent news coverage and other online coverage that presents both positive and negative views of the budget and programs it funds.

### **Deliberation Space.**

Participatory budgeting is all about making citizen voices heard, discovering their needs and priorities, and constructing community knowledge and commitment to shared goals. A strictly informational budget website can be a valuable resource to inform citizens prior to and during face-to-face budget sessions. However, creating deliberative spaces on the budget website can enhance the deliberative function. Citizens who might never speak up at a public meeting might find their voice in text submitted to an asynchronous online forum. Citizens could use a budget wiki to compile links to news articles from other cities explaining how well certain budget measures worked. A live interactive website ma

allow individuals who can't attend a public meeting in person to contribute questions and opinions. An online discussion can become a written archive, accessible to all community members, to serve as a record of how certain ideas developed. And just the sight of their words, their names, on the city or county website serves as a very vivid symbol of citizens taking ownership of their own government.

## **Social Auditing**

After deliberation and passage of a budget, online tools then serve an essential purpose in helping citizens monitor and evaluate the budget they have created. Online tools can support social auditing by observing the above principles. Public officials need to integrate the website into their standard financial record-keeping, perhaps by making the budget website the primary location for financial record-keeping, or at least formatting their primary records for easy export to the budget website.

### **EPB: A SMALL-SCALE PROTOTYPE**

These principles of electronic participatory budgeting may apply to government of widely varying sizes. For a simple illustration of what such ePB tools might look like, consider a small-scale prototype in the context of one small rural community in the United States that has never used participatory budgeting.

## **Community/Government Setting**

Madison, South Dakota, population 6,500, is governed by an elected five-person commission. The commission constitutes the legislative and executive authority for its jurisdiction. One of the city commissioners, the publicly elected mayor, serves as chair but has no separate executive veto power on budget matters.

The city produces budgets under constraints established by state statute. Under current practice, various agencies and citizens can present budget requests for the coming fiscal year to the commission at regular meetings. The city must produce its appropriation ordinance by the time of its first regular September meeting. The commission must pass its annual budget by majority vote by October 1; that budget covers the following fiscal year starting January 1 [31].

Currently the city of Madison appears to carry out a relatively smooth and efficient budget decision process. At the very least, the city commission produces its annual budgets on time, provides services, and meets statutory requirements [31]. Madison residents occasionally express a sense of dissatisfaction with city budget decisions, seeing more attention to the concerns of a commercial community elite rather than the community as a whole [15]. If city budgets do fail to represent a broad cross-section of community interests, part of the blame may lie with the lack of citizen attention to and participation in the budget process. Financial reports for the last two months and budget books for the coming, current, and last two fiscal years are available on the city website [12]. However, these documents do not receive a great amount of public attention: the Finance Office page drew 97 page views in December 2008, 1.04% of the total page views for the city website that month. (By comparison, the city sex offender registry drew 6.68% of December's views; see [14]) Those users who do access the Finance Office website to inspect city budget data find documents in PDF format, which discourages active engagement with the figures presented. Furthermore, to whatever extent citizens are viewing these documents, they are not finding any data that motivate them to come speak to the city commission about the budget. City commission budget meetings generally receive little public attendance or input.

None of this is to say that citizens in this community are uninterested in participating in city government or unwilling or unable to do so via the Internet. In September, the city website hosted an online poll, one of the first in its history, concerning a municipal electric billing “round up” program to support local scholarships. During the poll’s one-week duration, it drew 1281 visits, almost 10% of the monthly volume. This locally rare exercise in e-participation demonstrates the potential for public receptiveness to simple interactive online efforts to solicit public input on local policy matters.

## **Data**

This prototype participatory budgeting tool starts with one main dataset: the official budget books for the City of Madison for fiscal years 2004 through 2008 [13]. The budget books include the statutorily required itemization of budget categories, including detail on payroll, maintenance, and supply costs for each city department. The budget books also include historical data on total city expenditures since 1991.

The spreadsheet (produced and presented in mock-up here in Excel, but easily converted to a web application) derives summary data for major budget line items and for historical trends in total appropriations. From the historical totals from 1991 to 2008, the prototype calculates growth rates over rolling four-year periods, then calculates rolling annual averages using the following formula:

$$\mathbf{r} = (\mathbf{1} + \mathbf{r}_4)^{0.25} - \mathbf{1} \quad (1)$$

where  $r$  = rolling annual average based on  $r_4$ , the immediate four-year trend. The four-year trend is used to smooth out volatility in appropriations. Annual average increases are calculated by the same method for the first level of line items of the budget based on the available data from 2004 through 2008.

A historical baseline calculated by taking an Olympic average, dropping the single highest and single lowest rolling annual average values over the 18 budget years available. This Olympic average percent increase is then used as a baseline for discussion of potential budget increases or decreases: given that the city budget has increased an average of 6.5% over the past two decades, one may consider a city budget that freezes spending for a year or even offers an increase of just 2% to represent a significant reining in of normal spending trends.

On the basis of this data, the prototype then presents users with two interactive tools, each of which may be used by to identify spending and service priorities.

## **More or Less: Department Budgets**

The first tool has two main interfaces. First, the tool asks users to associate percentages with the phrases “a lot less,” “a little less,” “a little more,” and “a lot more” to describe their perceptions of budget increases and decreases. This interface also gives users the option to skip defining percentages and instead use one of a list of built-in decrease and increase ranges, based on the four-year rolling Olympic average, yearly averages, and inflation. Note that the user scheme reflects the idea of absolute increases and decreases, while the built-in schemes operate more in accord with normal public budgeting practices that treat keeping the budget “about the same” from year to year as increasing the budget just enough to keep up with rising costs and maintain existing services.

Should we spend a lot less in this year's budget? A little more? Well, that depends on what you mean by "a lot" and "a little."

Use the arrow buttons below to set the percentages to values that reflect what you consider to be "a lot less," "a little less," etc. when it comes to setting the city budget.

a lot less -10%	a little less -2%	about the same 0%	a little more 2%	a lot more 10%
▲ ▼	▲ ▼	▲ ▼	▲ ▼	▲ ▼

If you prefer, you can select one of the built-in schemes for determining increases and decreases.

- Use my percentages.
- Use parameters based on yearly averages for budget growth.
- Use parameters based on four-year averages for budget growth (smooths out volatility).
- Use parameters that assume "about the same" means keeping pace with inflation.

**FIGURE 1: "More or Less," percentage chooser**

The next interface asks users to recommend spending levels for ten main categories of municipal spending. Each category label would include a tool tip with a brief explanation, plus a link to a more complete explanation. As users select options on a five-point verbal scale ranging from “a lot less” to “a lot more,” an accompanying table displays the funding for each budget category for the current fiscal year, the percentage increase corresponding to the user’s recommendation and selected increase-decrease scheme, the resulting appropriation for the next fiscal year, and the resulting dollar increase (or decrease). That table also displays the net increase given the user’s recommendations.

How much would you recommend the city spend next year compared to what it spent this year on the given budget items?									
Column1	a lot less	a little less	about the same	a little more	a lot more	2008	percent increase	2009	dollar increase
Total General Government	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	\$ 524,150	-3.00%	\$ 508,426	-\$ 15,725
Total Public Safety	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	\$ 961,350	9.00%	\$ 1,047,872	\$ 86,522
Total Highways & Streets	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	\$ 832,700	-3.00%	\$ 807,719	-\$ 24,981
Total Sanitation:	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	\$ 12,000	-3.00%	\$ 11,640	-\$ 360
Total Health	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	\$ 2,500	-3.00%	\$ 2,425	-\$ 75
Total Culture - Recreation	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	\$ 418,050	-3.00%	\$ 405,509	-\$ 12,542
Total Urban and Economic Development	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	\$ 41,700	-3.00%	\$ 40,449	-\$ 1,251
Total Capital Outlay Accumulation	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	\$ 99,000	-3.00%	\$ 96,030	-\$ 2,970
Total Contingency	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	\$ 105,556	-3.00%	\$ 102,389	-\$ 3,167
Total Park & Recreation Fund	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	\$ 504,450	-3.00%	\$ 489,317	-\$ 15,134
<b>Total</b>									<b>\$ 10,318</b>

**FIGURE 2: "More or Less" spending priorities and results**

This application can include several options for deliberation and constructing community knowledge. After creating and revising a budget, a citizen may save the specific results, post a brief commentary on the choices he or she made, and open that budget to commentary from other viewers. Each citizen's budget choices can also be archived. That collection of citizen data could serve to adjust the default definitions of "a lot less," "a little less," and so on to reflect a community average. That data could also provide an aggregate budget, averaging everyone's choices into a numerical representation of community priorities, akin to the data produced in information markets [33]. None of these numbers need be binding to policy decisions, but they can serve as fascinating starting points for deliberation.

### The Chopping Block: Priorities

The second tool takes a different approach to defining priorities. The prototype lists ten slightly more specific budget items (for example, Fire and Police are separate items here, whereas in the "More or Less" interface, both are subsumed under Public Safety). The items are generally services citizens are familiar with, including Street Repair and Maintenance, Library, and Snow Removal. This list can be customized to reflect budget priorities informed by prior public discussion. In a slightly more complex manifestation, the list could be generated from various web metrics (perhaps city departments whose websites receive the most hits, or even rolling results from citizen polls or ratings of city services). Again, each budget item can include links to explanatory materials.

Users are asked to what extent they would accept cuts to each program if the city had to cut something to balance its budget. Users indicate the acceptability of cuts on a five-point scale verbal from "Yes, definitely" to "No, never." These responses are translated into ranks on a separate table. On this second table, users may indicate the number of programs out of the ten listed they are willing to cut. The tool then combines that number with the user's selected priorities and calculates potential savings (per program and total) over current rates from a spending freeze and an actual cut equal to the current rolling four-year average growth rate. In addition to presenting this information to the individual user, the tool would also compile the priorities marked by all users to create a cumulative ranking of all priorities. As with the "More or Less" tool, the "Chopping Block" can support user annotation and deliberative spaces where citizens may elaborate on and question the choices they and their neighbors are making.

Suppose we need to make cuts to balance the budget. Would you consider cuts in the following programs acceptable?

Programs	Yes, definitely.	Probably.	Maybe	Only as a last resort	No, never.
Community Center	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Economic Development (Chamber, LAIC, Planning & Zoning)	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fire	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Library	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
Parks and Recreation	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Police	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Snow Removal	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Storm Drainage	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
Street Building and Repair	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>

FIGURE 3: "The Chopping Block" priority selector

Program	2008 \$	4-yr avg growth	cuts in last 4 yrs	Cumulative Priority	Rank	Potential Savings: Freeze	Potential Savings: Cut by avg growth
Community Center	\$ 717,800	5.40%	0	17	<b>8</b>	\$ 38,788	\$ 77,576
Economic Development	\$ 244,700	10.11%	0	15	<b>9</b>	\$ 24,730	\$ 49,459
Fire	\$ 128,850	-2.02%	1	24	<b>5</b>		
Library	\$ 377,550	6.35%	0	25	<b>4</b>		
Parks and Recreation	\$ 504,450	5.65%	1	20	<b>7</b>	\$ 28,483	\$ 56,965
Police	\$ 832,500	6.54%	0	29	<b>1</b>		
Snow Removal	\$ 74,700	3.90%	2	24	<b>5</b>		
Storm Drainage	\$ 18,100	-3.99%	1	27	<b>2</b>		
Street Building and Repair	\$ 739,900	-0.29%	2	26	<b>3</b>		
<b>Number of programs to cut:</b>	<b>3</b>					<b>\$ 92,000</b>	<b>\$ 184,000</b>

**FIGURE 4: "The Chopping Block" Aggregator: cumulative rankings drawn from seven separate sample voters.**

## Benefits

Both “More or Less” and “Chopping Block” can serve several purposes. First, these prototype tools can educate users as to the nature of the city budget and the effect of various levels of increases or decreases in the context of inflation and historical budget patterns. Both applications capture useful information about which programs citizens value. Even in traditional budget settings where elected officials make all the decisions, data like this might help elected officials identify programs that are not meeting public needs or, at the very least, are not recognized as valuable.

Second, the prototype allows users to experiment with trade-offs. Users trying to avoid a net increase can quickly test different ways to, for example, pay for a desire to spend “a lot more” on Public Safety by piecing together smaller cuts in other areas, a challenge complicated all the more by keeping pace with inflation.

Third, the prototype gathers data from users online to create a rolling statistical assessment of general public support for various programs. Coupled with the deliberative text users may provide, these functions can support the further deliberations and decisions of a participatory budgeting group either in preliminary citizen education efforts or in networked meeting environments where citizens and elected officials can use this prototype to collect immediate data on group preferences and spending targets.

## FUTURE DIRECTIONS

This research provides a framework for promoting citizen participation in local public budgeting and a prototype online tool to support decisions in that context. Several clear directions for research follow from this discussion:

1. Incorporate more budget data.
2. Implement an informal test run of the prototype.
3. Study the utility citizens and elected officials derive from using such a tool.
4. Study how use of this tool might affect citizen participation in and satisfaction with local government. (Such research will require careful assessment of citizen attitudes prior to introduction of the tool.)
5. Determine whether tools like this prototype may be developed and maintained cost-effectively for small local governments. Perhaps there is some minimum population for whom a data-rich technological solution like this will provide any noticeable benefit over traditional budgeting processes.
6. Incorporate data from multiple and overlapping local governments to support broader community budgeting. The participatory budgeting literature focuses on engaging citizens in the budget process of one specific governmental agency at a time. However, citizens participating in the municipal budget process in Madison may support a tax increase to build a new swimming pool; however, that tax increase may reduce to capacity of city taxpayers to support efforts by the school district and county government to raise revenues for their own vital projects. An online, interactive budgeting program could turn this complex problem into a manageable public discussion.

Participatory budgeting offers citizens an opportunity to better understand and potentially have a greater voice in how their tax dollars are used. An online decision support system that crunches these numbers and helps citizens express and compare their priorities would help make participatory budgeting a more manageable and intelligent process. Whether implemented at the very small local level of Madison, South Dakota, or at national parliamentary levels, this joining of information systems and public participation may bring citizens closer to their government and produce better practical outcomes for all citizens.

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