BudgetMap: Engaging Taxpayers in the Issue-Driven Classification of a Government Budget

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ABSTRACT
Despite recent efforts in opening up government data, developing tools for taxpayers to make sense of extensive and multi-faceted budget data remains an open challenge. In this paper, we present BudgetMap, an issue-driven classification and navigation interface for the budgets of government programs. Our novel issue-driven approach can complement the traditional budget classification system used by government organizations by reflecting time-evolving public interests. BudgetMap elicits the public to tag government programs with social issues by providing two modes of tagging. User-initiated tagging allows people to voluntarily search for programs of interest and classify each program with related social issues, while system-initiated tagging guides people through possible matches of issues and programs via microtasks. BudgetMap then facilitates visual exploration of the tagged budget data. Our evaluation shows that participants' awareness and understanding of budgetary issues increased after using BudgetMap, while they collaboratively identified issue-budget links with quality comparable to expert-generated links.

Author Keywords
Budget classification; budget navigation; civic engagement; social issue; tagging; crowdsourcing; visual interface.

ACM Classification Keywords
H.5.m. Information Interfaces and Presentation (e.g. HCI): Miscellaneous

INTRODUCTION
A government budget is taxpayers' payment for services yet to be implemented. It is also considered as the single most important policy document of a government [19]. Accordingly, the ability for taxpayers to evaluate how a government spends their money is fundamental to a democracy [2].

To ensure budget transparency and public trust, many government administrations nowadays provide the public with data tables or interactive interfaces to understand how their fiscal resources are allocated. The impact of budget transparency is further amplified through public participation and collaboration [18]. Traditional participation channels include community scorecards, public expenditure tracking, and participatory budgeting [13]. More recently, online channels such as crowdsourced budget prioritization and digital budgeting have gained popularity. The advantage of using Internet-based technologies is well recognized as they enhance the delivery of quality public services and achieve broad public participation [20].

Despite numerous efforts for opening up government data, engaging taxpayers to make sense of the extensive and multi-faceted budget data remains an open challenge. The complexity arises as the budget is allocated to an immense number of public services and programs, as a result of reflecting various interests and tradeoffs in making budgetary decisions. Even though the budget proposals and plans are available online in many countries, these existing resources suffer from two main drawbacks: 1) they fail to reduce the complexity of the budget in their way of delivery to the general public, and 2) their static data format cannot accurately reflect public interests that constantly evolve over time. In addition, while taxpayers are capable of understanding complex issues and making informed decisions, government organizations lack suitable tools to leverage the wisdom of the crowd [26, 22].

To address these challenges, we present BudgetMap, an issue-driven navigation interface for the budgets of government programs. It allows navigating a government budget through a lens of social issues, which dynamically reflect public interests. To collect the necessary link information between social issues and budget programs, we explore human computation methods that elicit contributions from taxpayers. While domain experts might be able to find the links, this approach will not scale to constantly emerging social issues and millions of budget programs in a government. Automatic algorithms in a simple form would not work well as they may not be able to capture the nuances of complex social issues. Moreover, public participation can complement domain experts by introducing taxpayers' perspectives and local knowledge. It can also serve as an auditing channel to improve budget transparency. In this work, we turn to taxpayers for a scalable and participatory solution.

BudgetMap embeds tagging activities for voluntary users to participate in. To accommodate users with differing levels of motivation for participation, BudgetMap provides two modes of tagging: user-initiated and system-initiated. User-initiated

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