Investment Analysis and Methods of Estimating the Capital Costs in Capital Budgeting at the State Level in the USA

Natalia Ermasova
Assistant Professor of Public Administration
MMPA, College of Business and Public Administration
Governors State University
1 University Park
University Park, IL 60484
United States of America

Dwight Vick
Assistant Professor of Public Administration
MMPA, College of Business and Public Administration
Governors State University
1 University Park
University Park, IL 60484
United States of America

Abstract

The research focus is on the improvements in investment analysis in capital budgeting practices attributable to changes in the macro-economic environment during Great recession. In this study, a survey (2012) was undertaken to report on the current practice of capital budgeting techniques on state level in the USA. This survey attempts to find out whether capital budgeting techniques are used in evaluating capital projects in USA state governments. This study summarizes the results of the author's survey of 40 states "The Variety of State Capital Budgeting Processes." The data presented serves as an illustration of the state budgeting system and it may be of value to researches in this field as well as to policymakers in other countries wishing to improve their public investment and capital budgeting systems.

Keywords: Capital Budgeting, State Government, Investment Analysis

Introduction

The impacts of an era of resource scarcity have required states to undertake a range of responses to adapt to the changed fiscal environment. "Uncertainty requires that strategy is concerned less with specific actions and the more with establishing clarity of direction within which short-term flexibility can be reconciled with overall coordination of strategic decisions." (Hamel and Prahalad, 1989, p.67-68). This requires the improvements of planning and capital budgeting process. According to Schick (2008, p.40), "the multiyear projections inaugurated several years ago were a partial response to this problem." Jacobs (2008, p.22) proposes, "good multi-year planning furthermore supports overall fiscal balance, with more stable spending patterns for programs, and for their capital planning and execution. Good budget execution and procurement will enable timely, within-budget completion of projects (assuming good program and project management)."The literature on public capital budgeting recommends rational capital management practices, including long-range capital planning, multi-year fiscal planning, project management, and infrastructure assessment programs to enhance efficiency and effectiveness in public investment (NASBO, 1999; Aronson and Schwartz, 2004; Srithongrung, 2008; Mikesell, 2013; NASBO, 2014).

These following research questions are explored:

(1) During or as a consequence of the economic downturn of 2007-2009, were any changes initiated in the investment analysis as a part of capital budgeting processes employed by the states? Did states change the prioritization of capital projects, and methods of estimating the capital costs of investment projects during or as consequences of the Great Recession?

(2) Do agencies have standard practices for preparing the capital budget based on some form of investment analysis?

(3) Do the states have a Formal Reporting System to track Capital Projects?

(4) Do the states have a mechanism/process to evaluate the accuracy of capital budget estimates presented in the capital plan?

(5) What methods of estimating the capital costs of investment projects are used by the states and how it changes during economic downturn?

The research will provide insights that will be of interest to both public finance researchers and policy makers. The findings will allow state officials to compare the various techniques and investment analysis methods of capital budget preparation that are currently implemented by 40 states. This paper is structured as follows. First section explores the existing literature on the capital budgeting techniques. This section reviews and summarizes the existing literature on capital budgeting and trend of capital budgeting processes at the state level. Second section presents an analysis of practice of capital budget on the state level based on author's survey data "The Variety of State Capital Budgeting Processes."

Literature Review and General Direction Discussion

Strategic capital management includes: long-range objective setting (LROS), forecasting, capital budgeting, capital planning, implementation, audit, and control (Ammar, Duncombe, & Wright, 2001; Boex, Martinez-Vazquez, & McNab, 2000; Mikesell, 2013). Schick (2008, p.29) observed that program planning is linked most closely to budget preparation, but "it would be a mistake to disregard the management and control elements in budget preparation or the possibilities for planning during other phases of the budget year." A very important part is the analysis of efficiency of this strategic capital management. Strategy formation can be an intentional and deliberate process wherein organizations create future-oriented plans that are aimed at exploiting opportunities in accordance with the mission of the organization (Newman and Logan, 1981, p. 7).

In the private sector, management often has to evaluate a large number of capital investments opportunities. They are accountable for the management of organizational resources, which will be allocated to capital projects if and only if the investments are profitable and provide expected return to stockholders of the firm. When private firms evaluate capital project, they try to find the answer based on the following questions: (1) Does the decision rule adjust for the time value of money? (2) Does the decision rule adjust for risk? (3) Does the decision rule provide information on whether we are creating value for the firm?

The potential risks and rewards of these capital investments and major undertakings must be carefully weighed and evaluated. The essence of financial management in the private sector is to determine which capital investments are valuable and profitable to the firm. According to Burns & Walker (1987), discounted cash flow analysis, such as net present value, internal rate of return, profitability index, and breakeven time, as well as the payback period, are the most commonly used capital budgeting techniques in practice.

Whereas private firms often make capital spending decisions based on analytic techniques such as discounted cash flow and net present value, government has been slow to apply these methods because of: l) the amount of time involved; 2) the problem of determining a dollar value for government services; and 3) the lack of competence within the governmental organization to apply the techniques (Wiggins, 1980, p.20-22). Unlike private spending decisions, public sector decisions involve political and social considerations in addition to purely economic and legal considerations (Snyder, 1977). According to Hoyle (1972), Doss (1987), Halachmi & Sekwat A. (1997), Srithongrung (2008), and Mikesell (2014), capital budgeting is at the heart of financial planning. According to Perlman (2013, p.117), "spending decisions encapsulated in capital budgets are about investment, which is a longer term, and higher priced expenditure usually to buy longer lasting more durable things that produce future term, often imprecisely calculated, benefits, and payoffs that are called returns."

Farazmand and Neill (1996) wrote that the theory of capital budgeting in the 1990s is ‘‘at a crossroad in which the traditional quantification techniques have yet to be reconciled to the qualitative influences on the budgeting process.’’

Methodology and Results of Survey

Data were gathered from multiple sources. Several primary sources of information were used. The study is based on a series of in-depth personal interviews, as well as on correspondence with executives from forty states.
A survey entitled “The Variety of State Capital Budgeting Survey” was created to investigate capital planning and budgeting at the state level. Two surveys serve as a basis for this survey: (1) the survey of the U.S. Office of Management and Budget (1986) and (2) National Association of State Budget Officers (NASBO) report “Capital Budgeting in the States” (1999); some questions from these surveys were used “as is,” other questions were modified, and some additional questions were added. The survey covers the content of the capital plan, the capital project selection processes, the project management system, prioritizations of projects, and investment analysis methods that states used in 2011-2012.

There are following question in survey:

(1) How do the states estimate the cost of capital projects?
(2) Do agencies have standard practices for preparing the capital budget based on some form of investment analysis?
(3) Do the states have a Formal Reporting System to track Capital Projects?
(4) Do the states have a mechanism/process to evaluate the accuracy of capital budget estimates presented in the capital plan?
(5) What methods of estimating the capital costs of investment projects are used by the states?

The survey was sent to budget officers in all 50 states’ budget offices to collect the information for their respective states about capital budgeting practice before and during the Great Recession, about capital planning, financing, and about budget innovations. The survey was initially sent on October 29, 2011 and by July 1, 2012, 40 states had responded, a response rate is 80%.

Every state’s budget officers had the following options: (1) survey; (2) in-depth interview; (3) survey and in-depth interview. Some state’s budget officers preferred personal interviews over completing the written survey. Some state’s budget officers did the survey but also wanted to participate in a face-to-face interview. The interviewees and correspondence within each state were selected based on their knowledge of and experience with the capital budgeting processes within their states. The specific titles of the interviewees varied from state to state, with most of them holding a budget director (75% of responders) or budget analyst (20%). Interviewee responses were transcribed and then e-mailed back to the interviewees to ensure accuracy.

Also secondary sources of information were mobilized, including data from states’ web sites, BEA data, and NASBO reports. The National Association of State Budget Officers (NASBO) capital budgeting survey (1999, 2014), and the report *Budget Processes in the States* (NASBO, 2009) were used for comparison analysis of capital budgeting processes before and after economic downturn in 2007-2009.

A capital budget begins with the state budget office preparing guidelines, forms, and procedures that are provided to individual state agencies to complete. The comparative analysis reveals similarities and differences in preparation of the capital budget among the 40 states. Generally, the survey findings indicate that the states use similar approaches to prepare their capital budgets. There are also similarities in how the states use CIPs to select to the method used to finance capital projects.

According to the authors’ survey, the states’ capital budgets usually include estimates for a specific number of years and adhere to particular standards. States use a variety of cost estimation methods, for example, preparing cost options, considering life-cycle costs, and considering the cost standards building type (Table 1).

Techniques include value engineering, life-cycle cost analysis, construction and material indices, and square footage estimates. Almost all states use cost standards according to a particular type of building and space utilization standards to estimate costs, while about one half to two-thirds of the states prepare cost options and use life-cycle costs for cost estimating.

Table 1: Estimating Project Cost in State Budgeting Process from 1999 to 2013

	Number of states used this method		
Methods ofEstimating Project Cost	1999[1]	2012[2]	2013[3]
Cost Standards Building Type	33	39	41
Space Utilization Standards	36	36	43
Prepare Cost Option	27	28	43
Life-Cycle Cost	20	21	30

Most states used Space Utilization Standards and Cost Standards Building Type. The state officials (for example, engineers, architects, or one or more outside consultants) help requesting agencies with the more technical parts of their requests, such as construction or major equipment cost estimates. According to author's survey (2012), budget agencies used a combination of following methodologies to develop estimates**:** (1)relying on their own staff (90% of the respondents); (2) employing the assistance of architects and engineer (87.5%); (3) using historical data on past projects and national estimating guides (32.5%); (4) relying on professional cost estimators (40%); and (5) estimates based on national estimating guides (22.5%) (Table 2).

Table 2: Methodologies to Develop Estimates in State Capital Budgeting Process in 2012

Methods of evaluation of capital projects	**Number of states that use this method**
Relying on their own staff	36
Employing the assistance of architects and engineers	35
Using historical data on past projects and national estimating guides	13
Relying on professional cost estimators	16
Estimates based on national estimating guides	9

A central component of the capital budgeting process is the establishment of priorities within the extensive array of proposed projects (Premchand, 1983 2007). With scarce resources and limits on financing options in place in many states during the Great Recession, establishing a set of priorities is a crucial task. According to Chan (2004), capital projects in the public sector should be prioritized based on relevant criteria, including hazard elimination, legal mandates, regulatory compliance, commitment to project completion, preservation of existing assets, service improvement, and cost-benefit justification. According to Pagano (1986, p.96), "ensuring strict control over capital project selection can be attained both by establishing rigid project selection criteria and by specifying a precise ordinal ranking of those criteria. The more automatic the selection, the less likely it is that a bureaucrat can alter the process and impose his or her imprint on the capital budget."

According to the survey data, some states' Budget Agencies use *ranking techniques* of varying levels of complexity. A summary of the project prioritization section in different states is provided in Table 3.

[1]The National Association of State Budget Officers (NASBO). Capital budgeting surveys (1999) , p.31
[2] Author's survey (2012)
[3]The National Association of State Budget Officers (NASBO). Capital budgeting in the states (2014), p.71

Table 3: The Project Prioritization Section of the Capital Budget

State	Setting Project Priorities in 1999[4]	Setting Project Priorities in 2012
Arkansas	Prioritized by law and then released according to need and funding availability	Agencies are required to rank requests by priority
California	Based on criticality of program and availability of resource; functional component also involved	According to Government Code section 65041.1: 1) Development by rehabilitating existing infrastructure; 2) the Protection of environmental and agricultural resources by protecting; 3) and Preserving the state's most valuable natural resources; economic growth
Florida	Functional areas	Life Safety Issues; Americans with Disabilities Act Issues; Environmental Issues; General Capital Items
Indiana	Project by project basis	Health and Safety; State or Federally Mandated; Renewal and Replacement (Preservation); New Facilities
Massachusetts	Administrative cap for each of eight major oversight areas	Investing in public education; Supporting innovation industries; and Strengthening infrastructure.
Montana	Health & safety, critical maintenance, general maintenance, renovations, improvements, new construction	Needs, funding, intensity.
Nebraska	Agencies and universities set priorities. Executive branch and legislature decide which projects are most necessary	Each agency establishes the project priority for the projects in their respective agencies, and the State Building Division prepares priority designations for all projects based on safety standards, needs, the impact of not doing the project, etc.
Nevada	Life safety projects receive priority over maintenance or new construction. Executive branch and legislature decide project necessity	Project ranked according to priority order
New York	Budget Division analysis of critical needs	Permanent job creation; Revenue producing; Risk assessment (any risks to the project in terms of scope, cost, time, safety, and social and environmental impacts); Project Alternatives Considered
Virginia	Legal/judicial mandates; life safety codes; major repairs and improvements; new construction, expansions, acquisitions	Safety, health, regulatory, security, environmental requirements, or accreditation; Upgrading or replacing major mechanical systems and utility infrastructure; Renovation or maintenance of existing facilities; Construction, expansion, or acquiring facilities in order to meet programmatic needs; improving energy efficiency.

A variety of categories are used, with common ones being resource use and development (i.e., economic development), emergency situations, legal reasons, and health and safety considerations. According to NASBO (2014), problem severity and governor's priority were the most important ranking categories (45 states); health and safety was next ranking category (40 states); legislative priority was fourth category (39 states).

[4] NASBO report 1999 p.27

New York uses a ranking system based on categories such as Permanent Job Creation, Revenue Producing, and Risk Assessment (i.e., any risks to the project in terms of scope, cost, time, safety, and social and environmental impacts) in 2012.In 2011, Massachusetts established the following criteria for capital project prioritization: (1) job creation; (2) improving the economy and strengthening the infrastructure; (3) legal compliance; (4) preservation of a facility; (5) improvement in operational efficiency; (6) investing in public education; and (7) supporting the innovation industries. The Alaska Office of Management and Budget (2010) proposed the following prioritization criteria: "(1) resource development; (2) education; (3) public safety; (4) transportation/infrastructure; (5) military support." According to the Indiana Capital Budget Instructions, "Capital Budget Development Process for FY 2012 and FY 2013," all capital project requests must be prioritized according to the following prioritization criteria: (1) health and safety; (2) renewal and replacement; (3) state or federally mandated; (4) new facilities; and (5) improving the economy and strengthening the infrastructure.

Virginia's Department of Planning and Budget and the Governor's Cabinet Secretaries categorize its capital requests based on the following criteria: supplemental funding needed for equipment or other reasons, emergencies and code compliance, broken infrastructure, renovations and improvements, and acquisitions and new construction. Virginia legislation states that the following priorities should be used: (1) safety, health, regulatory, security, environmental requirements, or accreditation; (2) upgrading or replacing major mechanical systems and utility infrastructure; (3) renovation or maintenance of existing facilities; (4) construction, expansion, or acquiring facilities in order to meet programmatic needs; (5) improving energy efficiency.

For the respondents whose organizations use investment analysis techniques, over half indicated that Net Present Value (15% of the respondents), Return of Investment (20%) were the primary evaluation criterions for their decisions and the net present value method was the most widely used discounted cash flow analysis (about one-third) when compared to internal rate of return, profitability index, and breakeven time. About 32 percent of the respondents said that they used different appropriate criteria to evaluate capital investments, for example, one state said "*The overall project is evaluated from all perspectives using the myriad of analytical techniques.*" About 35 percent of the respondents did not impose a specific method for investment analysis or for rejecting capital projects (Table 4).

Table 4: Investment Analysis Methods in 2012

Methods of investment analysis	**Number of states that use this method**	**Percent to 40 respondents states**
Net Present Value	6	15
IRR	8	20
Methodologyvaries based on the project	13	32.5
No standard practices in place for preparing a capital budget	14	35

The preceding findings stand in sharp contrast to the survey results of Fortune 500 companies but are similar to results of small business firms. Burns and Walker (1987) reported that 84 percent of Fortune 500 companies used internal rate of return while 73 percent used net present value. Chan (2004, p.40) suggests that "a survey of capital budgeting practices of Canadian municipal governments reveals that a minority used capital budgeting techniques; payback period dominates over discounted cash flow analysis in evaluating capital investments; and pitfalls are common in its application." Analysis of authors' survey shows that when there was conflict in preference using multiple methods, 70.7 percent of respondent states gave either the internal rate of return or net present value method priority. During the recession following states improved methods of investment analysis: Delaware, Indiana, Montana, Nevada, Tennessee, Pennsylvania, Washington, and Wisconsin.

There are formal reporting systems to track capital projects in many states. There are some examples of formal reporting system in state capital budgeting processes. Act 876 of 1973 established "uniformity in operating and capital budget preparation, presentation and execution" among state agencies and made the Arkansas Department of Finance and Administration (ADFA) share the responsibility for putting together budget information forms containing comparative fiscal data from the previous and current year, as well as the next two-year period, to aid state agencies in planning[5]. California uses the Capital Outlay Project Tracking System.

[5]Arkansas Department of Finance and Administration.http://www.state.ar.us/dfa/(accessed September 14,

Florida uses Facilities Accountability Tracking System (FACT). The Georgia's Capital Budgeting Unit performs specialized financial, technical, and policy reviews and analyses related to the state's major capital outlay projects and programs. The unit provides technical support and assistance by assisting OPB Budget Divisions with review and analysis of specific projects for which funding is being requested or considered. The unit interacts directly with other state agencies involved in statewide capital issues and ongoing capital project planning, programming, design, construction, repair, and renovation activities. Indiana created BudSTARS program for formal reporting system in 2009. Massachusetts's Executive Office for Administration and Finance (EOAF) has the full five-year capital investment plan by major investment categories and also undertake a formal reassessment of capital investment needs to develop an annual update to the five-year capital plan.[6]New York's Division of the Budget (DOB) has developed the Capital Projects Database (CPD), which is a statewide, web-based, secure application that will be used to capture agency capital project information. The Texas Bond Review Board (BRB) developed a formal process for submission of capital projects from all state agencies. Most states- 70 percent of states (28 of 40) use mechanism to evaluate the accuracy of capital budget (Table 5).

Table 5: Formal Reporting Systems to Track Capital Projects and Mechanism to Evaluate the Accuracy of Capital Budget in 2012

	Number of states	
	Yes, formal system/ mechanism	No formal system/ mechanism
Formal Reporting Systems	33	7
Mechanism to evaluate the accuracy of capital budget	28	12

States use certain procedures to evaluate the accuracy of capital budget estimates presented in the capital plan. 12 states answered that there is not a regular mechanism for evaluating the project after approval. There is no formal mechanism—other than tracking actual expenditures compared to what was appropriated—and lapsing unused funds if available.

The survey data provide information on how the states described the factors that are important for their decisions on what type of project financing to use (Table 6).

Table 6: Factors for Making Decisions of Capital Financing in 2012

Important factors for the decisions of capital financing	**Number of states that consider this factor for capital financing decision**	**Percent to 40 respondents states**
Funding availability	30	75
Size of the project	14	35
Type and life of the project	21	52.5
Cost of various funding mechanisms	4	10
Political climate	3	7.5
Budget outlook	3	7.5
Urgency of project	3	7.5
Tax laws	6	15
Life safety issue	8	20
Other factors	5	12

The majority of states highlight the following factors: funding availability (52.5), project type and life (52.5%),project size (35%), life safety issue (20%), tax laws (15%), and urgency of project (7.5%) (Table 6). Among other factors are following: (1) the number of permanent jobs anticipated; (2) deferred maintenance; (3) federal programs that are available; (4) court order, and (5) benefit to taxpayer.

2009)."Reorganization is Approved by Legislature." *Arkansas Gazette*, February 3, 1971, pp. 1

[6]Executive Office for Administration and Finance (EOAF) http://www.mass.gov/bb/cap/fy2009/hdefault.htm

Conclusion and Recommendation for Future Research

Based on the experience of state capital budgeting, this paper attempts to describe the methods of investment analysis and estimation of costs that can be implemented to improve the effectiveness of the evaluation of capital projects. Even though discounted cash flow analysis such as the net present value method and the internal rate of return method are widely used in the private sector, its use among USA state governments is not as widespread. The findings thus far imply that the majority of state governments neither use capital budgeting techniques nor consider much about intangible costs and benefits in making capital budgeting decisions. This may lead to improvements to the decision-making process are needed.

Advanced technologies have released budget officers from a conventional accounting focus and have added to their "interpretive" focus. In an environment of economic decline, multiple organizations, and diffuse political power, budget officers are called upon to exercise facilitative and interpretive skills; they must coordinate multiple streams of information and agendas that are often divergent. Following states had greater emphasis on the prioritization and selection process: Alaska, California, Indiana, Massachusetts, Montana, Nebraska, Nevada, New York, and Virginia. Many states improved budget-making through a special computer database and developed a comprehensive analysis of the capital budget needs (observed in Indiana, Missouri, South Carolina, Tennessee, California, Indiana, Wisconsin, Virginia, and Washington).

The survey results present variations in capital budgeting behavior that may spark ideas for change in existing investment analysis and capital budget processes and administration. Thus, it has the possibility of stimulating study, policy debate, and innovations in public budgeting. Finally, this research will expend knowledge of capital budgeting for practicing planners, developers, budget analytics, debt managers, and policy makers in the areas of regional collaborations, capital planning, and capital budgeting. This research provides continuing capital management assessments and tools to improve capital budgeting. This study feature key recommendations to policy makers, budget analytics, and debt managers on how to manage capital infrastructure better.

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