Using Capital Budgeting for Managing E-Government Expenditures

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Abstract: This article offers government officials, particularly local officials, a plan to finance their technological infrastructure. Our proposition of a fee-based financing structure rests on the guiding principles of capital financing, primarily the principle of equity.

Keywords: capital budgeting, e-government, Internet financing

INTRODUCTION

The e-revolution is here, and many citizens and taxpayers use its products and experience its impacts every day in a variety of ways. According to the Government Accountability Office, formerly the General Accounting Office,[1] an estimated 110 million people in the United States now use the Internet. The National Telecommunication and Information Administration reports that 43.6 percent of persons in the United States reach the Internet from their homes and 53.9 percent access the Internet from home, business, or other locations.[2] Governments, at all levels, believe that by keeping pace with the private sector

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and spending billions of dollars for information technology (IT) to deliver information and provide services will result in efficiency, productivity, reduced costs, and enhanced citizen participation.

While all citizens want to know whether investment in e-government technology will transform government by developing management, improving accountability, and enhancing citizen participation, significant questions about fair implementation of IT policy have emerged, particularly questions regarding the financing of such technology.\[3\] Fairness questions ask whether IT spending should be a part of the general operating fund paid for by all residents in the community through taxation or financed through short-term or long-term debt ultimately retired by user fees and charges to those people using the service. The financing question is a crucial one: research suggests that the transformational potential of e-technology to yield widely distributed efficiency benefits has been overstated. Government managers’ uses of IT and IT’s development remain in their infancy.\[4\] We argue there is resolution or at least a portion of a resolution: Governments, particularly local governments, should devise a capital plan to finance their technological infrastructure using the guiding principles of capital financing—equity and efficiency.

The argument supporting our recommendation begins with an explanation of the different organizational phases of Internet utilization for any government. This is an important portion because it places the Internet and e-government development into perspective. Next, we discuss capital financing principles, how those apply to e-government, and the equity and financing concerns posed by e-government. Finally, examples are provided illustrating the current trends and practices of funding technological projects. We consider the characteristics of e-government phases as primarily consumption or investment, the benefit incidence of the e-government phases, and the burden of paying these benefits in clarifying appropriate financing schemes. Our analysis suggests that equity and efficiency are most likely achieved when a fee-based financing structure is used.

**DEVELOPMENTAL PHASES**

To begin e-government may be defined as a developmental phenomenon. That is, governments use the web in successive phases: formative, distributive, transactional, and transformational or integrative.\[5\] Others see the four phases in a slightly different but basically complementary way.\[6\] Table 1 (column two) describes each in detail. Planners predict that all governments will pass through each of these phases, even if at different times.

Each developmental phase affects the relationship between government managers and important people and groups outside. The various relationships suggest a capital financing strategy that may differ as development takes place. Looking at all phases, Hyde\[7\] defines e-government as “the delivery of information and service on-line through the Internet and other
Table 1. Four Developmental Phases of Government Information Technology

<table>
<thead>
<tr>
<th>Developmental Phase</th>
<th>Description</th>
<th>Non-Exhaustive</th>
<th>Non-Exclusive</th>
<th>Consumption</th>
<th>Investment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Formative Phase</strong></td>
<td>Identify government as having a web page with basic information, a “billboard” phase, with effort to post information—news and views—to a broad audience.</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td><strong>Distributive Phase</strong></td>
<td>Use the web page as a means of dispensing information that may be downloaded by anyone who has access to the web page often with the option to transmit information back to the government.</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td><strong>Transactional Phase</strong></td>
<td>Allows a mechanism on the web page that allows the completion of a procedure such as applying for a permit or paying a parking ticket.</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td><strong>Transformational Phase</strong></td>
<td>Systems that provide a instantaneous and contemporaneous means of interaction among agencies within government and between agencies and outside parties, linking transactions to back-office operations such as encumbrances and budgets, purchasing, accounting and accounts payable.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

*aSource: Miranda, 2001, 6.*
digital means.” This dissemination of information is between the government host and the consumer of such information, a private citizen, a private business, or another government. Many examples of e-government exist: access to general government information such as town hall meetings and minutes, the government structure, financial information, as well as access to government electronic services such as renewing driver's licenses, paying parking tickets, filing taxes.

The formative phase, begins with simple homepage development and the posting of basic information—town hall hours, town meeting minutes, budgeting and financial information, tourism and recreational activities, to name a few. For the most part, local governments have passed through this phase. For example, Moon reports that 82 percent of municipal governments have a formal web site. However, only 27 percent of these municipal web sites have been up and running for more than three years. Esser reports that in 2000, 25 percent of state and local governments in the United States and Canada posted budget information on their homepage. Research conducted by Hart-Teeter estimates that 83 percent of those government workers surveyed say their organization provide documents on-line; 72 percent post calendar and event information; 66 percent supply information regarding constituent services, and 58 percent say their organization furnish a search engine. The Pew Internet and American Life Project finds that 77 percent of those interviewed—Internet users who have visited at least one government web site—get tourism and recreational information; 62 percent seek information about a public policy or issue; and 63 percent are looking for what services the government provides.

The distributive phase goes one step further allowing citizens and businesses to download forms; for example, tax forms, job applications, voter registration forms, purchase order forms. Also, this stage provides two-way communication where citizens can transmit information back to the government; for example sending comments and concerns to public officials. In the year 2000, 45 percent of state and local governments in the United States and Canada said they provided forms online. Sixty-three percent of the Internet users visiting a government web site have downloaded on-line government forms. Furthermore, 64 percent of agencies in the United States offer a feedback/comment mechanism. Of the Internet users visiting a government web site, 34 percent have sent comments about an issue to a government official.

Governments are using the Internet to provide public services electronically. This transactions phase allows users to pay parking tickets, renew driver's licenses, or pay taxes. The goal of managers in this phase is cost reduction in such services by creating a more efficient department as well as downsizing government. Since the dawn of the Internet, the transactions phase has been overshadowed by the information-seeking phases—formative and distributive phases. For example, of those interviewed for the Pew Internet and American Life Project, 16 percent have filed taxes on-line; 12 percent have renewed a driver's license or vehicle registration; 7 percent have renewed
a professional license; 4 percent have used the Internet to get game (i.e., hunting, fishing) licenses; and 2 percent have paid a fine on-line. Low usage of these online services suggests that the majority of states and local governments across the country do not offer these services electronically. Moon\textsuperscript{16} finds that 1.4 percent of municipalities provide online payment of fines; less than one percent have the ability to provide online payment of taxes; and 1.5 percent provide online payment of license/permit fees.

Some governments are passing or have passed through these first three phases—formative, distributive, transaction all of which are essential to productivity enhancement—and have arrived at the integration, or transformational, phase. Here Internet applications and government agencies’ systems, for example purchasing and accounts payable, are linked together. Government purchasing and accounts payable agents may have direct on-line connections with vendors. In addition, citizens may have web or email access to centralized collection contact points for case management, that may make up a Constituent Relationship Management System in its own right,\textsuperscript{17} one that has as well field operation connections and database-building capacity for analysis and evaluation of work processes. Some believe that this phase is crucial and must be planned appropriately for the other phases to be successful.\textsuperscript{18}

### CAPITAL FINANCING PRINCIPLES AND E-GOVERNMENT

Support for the e-revolution within the public sector makes sense as government managers seek ways to make their organizations more efficient and more productive as well as to enhance citizen participation. In fact, public officials display more enthusiasm than the average adult citizen about the revolutionizing capacity of the Internet to improve government performance. For example, Hart-Teeter\textsuperscript{19} reports that 92 percent of government officials and 76 percent of institutional customers believe that the Internet will yield “better government.” In contrast, 56 percent of the adult population (Internet and non-Internet users) hold this view.

However, our proposition is not founded on the potential managerial improvements that may occur, although we note the enthusiasm behind the initiative. Our focus, one overshadowing the productivity aspects of transformational e-government efforts, lies in the incidence of financial benefits and burdens associated with information technology capital purchases. We do not question the justifiable enthusiasm, but we believe that before more governments, particularly local governments, speed along the information super-highway to catch up with the private sector and the federal government, financial analysis must have some influence. Financial analysis will help to take into account the equity aspects—financial burdens allocated according to ability to pay and benefits received—of investments in the technology that will support all phases of e-government development.
Aspects of Equity

Equity or fairness, when analyzing government expenditures, refers to the incidence of spending, the way policy distributes economic benefit and burden of capital spending. That is, equity in allocating the burden of financing and distributing the benefits of any government purchase refers to the analysis of who benefits from the purchase and who pays for the service and the application of a standard from moral philosophy to suggest fairness.

Varying degrees of received benefits exist. At one extreme, widely received benefits are defined as public goods and services because they are not exhaustible or exclusive. Non-exhaustible public goods and services are those that can be consumed at any given time by any number of people without diminishing the quantity available; each person should pay for these goods according to his or her ability to pay regardless of benefits received from individual consumption. As the good becomes exhaustible, some measure of benefit or use should dictate who pays, welfare economics theory holds. Non-exclusive goods and services are those where consumption is not distinguishable between those who have paid and those who have not paid for the good or service. As the good becomes exclusive, again, theory holds that some measure of benefit or use should specify who pays.

Pure public goods, such as national defense and education, are non-exhaustive and non-exclusive. That is, society, as a whole, benefits and therefore citizens pay according to their ability; based on principle, pure public goods are equitable. Toll goods such as roads and bridges are those that are non-exhaustive but exclusive—those benefiting from the service pay via user charges and user fees. These goods also achieve equity. E-government, its phases, and the immediacy of benefits via consumption and investment need to be defined within a matrix of non-exhaustive, non-exclusivity. Columns three and four of Table 1 present a simplified matrix.

From a macro perspective, e-government as a collective good is non-exhaustive and non-exclusive. E-government is non-exhaustive because any number of people can surf a government web site at the same time without depleting the service (granted the more people visiting at the same time creates a potential for slower connection and download times). In addition, government web sites are non-exclusive, tax paying and non-tax paying citizens cannot be separated. For example, no one can be excluded from downloading town hall meeting minutes or researching a local ordinance. However, non-exclusivity only applies to those tax paying and non-tax paying citizens with access to the Internet. Many people are excluded from obtaining such general information simply because they do not have access to the Internet.

The macro perspective offers only a partial analysis of e-government as a collective good. A micro analysis is necessary to investigate equity among the different developmental phases as well as immediacy of benefits from consumption and investment standpoints. We begin with the four developmental phases.
For the most part, the phases of e-government development remain non-exhaustive, but become primarily exclusive. In the broadest sense of these phases, the formative, distributive, and transactional phases are exclusive only to those who can visit a municipal web site, download information, and perform transactions. These three phases move e-government away from being a pure public good toward a toll good. The transactional and distributive phases, however, have the potential to benefit society, as a whole, through its efforts to make government more efficient, but its access is still limited. For example, paying a parking ticket on-line instead of mailing it to or visiting the public office responsible for this transaction creates more time to perform additional transactions at the office. In addition, the integration of systems links information together. If the parking ticket remains unpaid, the police department and accounts receivable could access the same information. If parking violations continue, the police have a record of the vehicle and the number of unpaid parking tickets, and accounts receivable have record of how much revenue is outstanding.

Although access to e-government is limited, certain aspects of each phase will make government more efficient, which benefits society as a whole. When this occurs, the phases move e-government away from being an exclusive good back to being a public good. The immediacy of benefits at each phase, however, affects equity.

Capital spending differs in the immediacy of benefits. In many cases, e-government initiatives provide ready access to current information and encourage efficient transactions. As such, the initiatives are initially consumption oriented as we define the orientation; that is, the spending has little affect on short-term equity but improves short-term efficiency for citizens, businesses, and governments. Some phases of e-government development have investment characteristics; the spending in these phases is intended to have a positive effect on long-term—over time or future consumption—equity and efficiency for citizens, businesses, and governments. The fifth and sixth columns of Table 1 present these differences.

In the formative stage, e-government web pages provide basic information. To facilitate government operations as well as knowledge of them, this phase has only consumption benefits, primarily the consumption of information. In the distributive phase, again, web pages and communications technologies facilitate the spread of information about government operations as well as the option of replying through these technologies. Again, these facilities are consumption oriented. Within these two stages, benefits are immediate but only to those citizens, businesses, and governments with Internet service; therefore, short-term equity is nonexistent. Immediate access to information improves efficiency, however, for the citizen, business, and government because information is provided to them at the click of a mouse; phone calls or visits to the government offices are no longer necessary.
Government spending on the transaction and integrative phases improved short-run and long-run equity and efficiency. For example, at the transaction phase interaction and the development of a relationship, however primitive, allows for development. As developmental, the transaction phase has investment characteristics. The relationship building may be such that business development may be the primary focus, especially in the distribution of government spending in such a way that businesses thrive. However, the relationship building may also be such that the citizen-government relationship also develops, especially in the transparency of government operations and the trust that builds through that transparency.

At the integrative, or transformational, phase, not only is there consumption but investment as well, an investment in efficiency in government operations. This efficiency can come through the integration of government operations, improvements in constituency relationships, or improved operations involving businesses in regulation or vendors in the near instantaneous working of the supply chain.

Overall, government spending at all four phases results in efficiency in the short-run and long-run, but equity is not achieved until the long-run. Keeping in mind the aspects of equity, we turn to equity concerns surrounding financing mechanisms.

**Financing Concerns**

Equity concerns also affect financing mechanisms. For example, pay-as-you-use or current year financing forces current taxpayers to fund capital purchases that benefit them and those in future generations. Debt financing and leases may allocate funding burdens in line with benefits received across generations.

In addition, equity may also differ, as the definitions of groups emerge as either segmented or block in nature. E-government financing might differ between segments of the government's web user environment, particularly between businesses and individuals just as tax systems do. Block inequities, however, may give rise to special concern about financing e-government in that blocks within the government's web universe—especially poor and rich but also those with a work disability and those without, those in one race or ethnic group and those in another—require equal treatment.

Finally, the useful life of e-government projects also gives rise to equity in financing concerns. Much software has a short life before purchases of upgrades become necessary for the sake of efficiency, compatibility, communicability, and even outright continued use. To a lesser extent, but for the same reason, hardware has a relatively short useful life as well. The debt or lease financing of e-government may not provide symmetry between the useful life of the project and the period over which the government will pay for
the project. The asymmetry gives rise to inequity, again, in the groups receiving benefits and the groups paying for the projects.

Financing capital expenditures is effective when sufficient funds exist. Using own-source current revenues might be effective when there are small capital needs; whereas borrowing might be more effective for large capital purchases or improvements. Efficiency is achieved when the costs associated with the selected financing tool are low relative to other methods of financing.

Those people governments serve the most—poor, elderly, less educated, disabled—are the ones served the least with e-government and this violates the principles of equity. Access, therefore, poses severe equity problems that, in turn, reveal distinct financing problems for infrastructure fueling the e-government revolution. In order to finance e-government properly, government officials must understand what information is in demand and who is utilizing the information.

How can governments maintain equity while transforming their management systems? If government leaders can finance e-government projects with an appropriate strategy, they will preserve equity. The next section offers some current trends in financing e-government and follows that discussion with an analysis of e-government benefit and burden incidence to guide financing strategy.

FINANCING THE INTERNET: CURRENT TRENDS & PRACTICES

The principles previously discussed are fundamental to capital financing. And capital financing is a useful tool to manage the technological infrastructure of governments. Since e-government is a service provided by government that has limited access, we ask: Should all residents in a community finance the digital highway infrastructure when it is possible that the equity principle is being violated? Where should the revenues come from to finance the digital super highway, through broad-based taxes such as that on individual income or narrowly focused user fees and charges? The general operating budget? The capital budget?

Some governments struggle with the accounting of technology: is it a capital expenditure or is it an operating expenditure? Computers and management systems and technology projects are, for the most part, expensive, non-recurring capital costs. Major expenses occur in the beginning to get a government’s system online, but smaller operating and maintenance costs will occur thereafter. Furthermore, the life-span of technology is relatively short lived; the computers, hardware, software used and technological projects maintained by governments need to be upgraded within five to ten years.[23] Determining the appropriate financing method is difficult, however. What is the most effective and efficient way to finance different technology projects—office
computers to the technology supporting renewing a driver’s license online? Three major trends are emerging: leasing equipment, charging a fee, and outsourcing. These financing methods can and do exist at the four different phases.

Technology projects are unfit for long term bonds because of the shorter life span so some governments are leasing technology. Salverda\textsuperscript{[24]} argues that leasing is “more feasible for purchases that are too large for direct purchase and too small for debt issuance.” In addition there is no voter approval. Many companies, like Dell, offer “refresh leases” to governments. Here, the lessee—the government entity—can trade-in the old equipment for newer, updated equipment.

To achieve equity, some governments are charging fees for e-government.\textsuperscript{[25]} Using user fees and charges, governments are not increasing taxes on all in the community; rather they are recovering the cost associated with e-government by charging those who are directly benefiting from the service. New York City provides its citizens with the opportunity to pay parking ticket fines online. “With the online payment option, [parking violators] no longer need to mail fines or appear in person at designated locations.”\textsuperscript{[26]} By charging a “convenience fee” for this service, New York achieves equity—those directly benefiting are paying—while maintaining efficiency.

In addition to charging a fee, governments are outsourcing the production of certain online services. For example, ServiceArizona.com developed and hosted by IBM allows customers to renew vehicle registrations online. “IBM gets 2 percent of the value of each transaction ($4 per registration) and to motor vehicle department saves $5 per transaction (online service is $1.60 compared to $6.60). Total savings to date are about $1.7 million annually with only 15 percent of renewals being done on-line.”\textsuperscript{[27]}

What matters in choosing a financing strategy? We consider the characteristics of e-government phases as primarily consumption or investment, the benefit incidence of the e-government phases, and the burden of paying for these benefits in clarifying appropriate financing strategies.

**Characteristics of E-Government phases**

As either consumption or investment spending, the e-government phases suggest appropriate financing methods. Simply, those who benefit here and now, having an impact here and now, should finance consumption spending. Investment spending, however, will have benefits far into the future, either as e-government investment builds a dynamic basis for change and further innovation or as this spending provides facilities that will have a useful life of many years. The e-government initiatives also may stimulate investments by citizens or businesses in their desire to exploit opportunities the government efforts provide.
Whether the benefits are immediate or long-range, the financing must follow logically to preserve equity. Consumption spending provides immediate benefits and, equitably, the burden falls on those immediately benefiting. Investment spending will benefit future generations. To preserve equity, the future generations should bear their share of the burden in return for the benefits they receive.

**Incidence of Benefits and Burdens**

Financing techniques differ for consumption and investment spending and, therefore, for the different phases of e-government development. These spending patterns also are shaped by the access businesses and citizens have to the web and other technologies and the progressivity of government policies toward tax structures. We have stated that web-access is markedly restricted, whether self-imposed or not. As a result, restricted access limits the benefits of e-government innovation immediately.

Tax structures may complicate the equity problems of e-government spending. In the worst case, regressive tax structures, favoring the wealthy with lower effective tax rates, place a higher tax burden on the poor. That is, the poor pay more for a service for which they receive very little, if any, direct benefit. The worst-case problem finds a partial solution in progressive tax structures, favoring the poor with lower effective tax rates. Here, the wealthy pay more because of a greater ability to pay and receive direct benefits from the service while the poor, although still realizing some incidence, are paying far less for fewer benefits.

The principle of vertical equity is maintained while, at the same time, achieving greater market efficiency where benefits received depend on payment. Only at the integrative phase of e-government development, although perhaps also to some extent at the transactional phase, is there a possibility of an e-government project having a positive effect on long-term, non-governmental sector growth. At this phase, long-term benefits, and equity, can require long-term burdens. Yet, again these burdens may be unfairly distributed unless the tax system is one that is proportional or progressive.

**Propositions for Financing E-Government Infrastructure**

Our analysis provides initial propositions for financing. These propositions are derived from the characteristics of the phases of innovation as consumption or investment, the benefits incidence of this infrastructure at present, and the burden demanded by the tax structure used to pay for infrastructure. First, we argue that, all other factors ignored, the more consumption oriented the infrastructure project, the more equitable it is to have current taxpayers pay
for it. The more investment oriented the project, we argue, the more equitable it is to have both current and future taxpayers pay for the stream of benefits they will receive.

Second, we argue that consumption or investment has limits in the access reasonably available to the benefits of the infrastructure project. Although future access may be hard to forecast, current access problems suggest that either consumption or investment benefits will fall primarily on the wealthy rather than the poor. The less reasonable access the infrastructure project allows, we argue, the more the burden of paying for these benefits should fall on current and wealthy taxpayers.

Finally, we argue that the characteristics of the projects and the access to their benefits have even greater financing problems in the tax structures that exist in governments pursuing e-government innovation. The more regressive the tax structure, the more consumption oriented the project, and the less reasonable access the project provides to all income classes, we argue, the more the burden of the projects should fall on immediate and wealthy taxpayers.

CONCLUSION

We have suggested that before local governments speed along the information superhighway, that they consider the principles of capital financing. We have demonstrated that placing the incidence on all citizens violates the principle of equity. To achieve equity we reviewed some of the current trends of e-government financing. We have also subjected the phases of e-government development to incidence analysis to form a basis for making equitable financing decisions. At present, much of the evidence favors financing structures that place burdens on those who have access to the benefits of these projects. Those receiving the primary benefits are those more wealthy than poor. Tax systems favoring the wealthy—regressive systems—complicate these benefit problems, in a sense, forcing the poor to finance projects that benefit the wealthy.

What financing mechanisms seem to fit the infrastructure development of the e-revolution and also preserve equity in financing? Recall the major financing schemes presently used for e-government projects. Current taxes and revenues as the primary support for these projects spreads the financing burden over all present but no future taxpayers, making this source of funding appropriate for consumption-only phases of e-government development. Equity problems exist, however; only a minority of current taxpayers seems to be receiving any benefits from consumption-phase e-government. Long-term borrowing spreads the burden over current and future taxpayers. In progressive tax systems, long-term bonds fit the equitable financing requirements of investment-oriented projects. Fee-based systems for financing projects burden current users of the infrastructure projects, conforming to the current profile of
major users when these projects can be characterized as consumption, rather than investment, spending.

Technology is constantly changing and in need of upgrades, that fee based financing is most equitable for users of today and tomorrow—systems always need to be upgraded to deal with the new technology. The burden, therefore, is placed equally on present and future users. In line with this analysis, fee based financing schemes, for all but investment projects, provide for the most equitable and efficient financing techniques.

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