Cost-Benefit Analysis of e-Government Investments

Sorin Kertesz

Harvard University
J.F. Kennedy School of Government
May 2003

Cost-benefit analysis of e-Government investments

"Providing the online channel may end up costing governments more than any amount they could save." [1]

1. Introduction

The positive results and the hype of e-Government in developed countries have determined many governments in developing countries to launch similar initiatives. But these initiatives are not always based on economic soundness – instead they are fueled by lobby groups, pride or international pressure. As countries consider launching e-Government projects, they need to assess their timeliness and economic value. Hundreds of millions of dollars are spent on such projects, so performing a cost-benefit analysis of these investments is crucial.

The story so far:
E-government has been spreading and improving fast in developed countries throughout the last few years. After the shy experiments of the beginning, better and more complex government websites/portals have been built – offering new services and improved customer satisfaction, while reducing operating costs.
But, in a similar manner to the boom of e-business, governments have overestimated the benefits and disregarded the risks/problems associated with e-Government projects. As an effect, they often launched such projects based on non-economic reasons: visions of an all-web-based service delivery, pressure from IT departments, from constituency or from other states/countries, or a desire to experiment with new technologies.
When e-government implementers are asked whether they have performed a cost-benefit analysis before embarking on such ambitious projects, the answer is almost always negative. In most cases the issue of assessing the value-added of the project has never been raised until after its implementation.
Ultimately, some e-government initiatives were analyzed in retrospect and, in many cases, the analyses have shown cost-savings and efficiency improvements[2].

Now, as developing countries are looking at developed ones, they see the positive results and the technical advancements in the digital delivery of government services, so they feel the need to become part of this trend. They are planning numerous investments in e-government initiatives in order to catch up, but most projects simply copy the western model (and hope for the same success), rather than performing a critical analysis based on local needs and resources. The "think globally, act locally" mentality is replaced by a "follow the leader" approach, generating unsound investments and misallocations of already scarce resources.

The purpose of this paper:
This paper provides an accessible selection methodology for evaluating the opportunity of e-government projects in developing countries.

[1] Deloitte Research, "Transforming the Government Enterprise Through Customer Service - Next Generation E-Government's", 2001
[2] Caution should be used when evaluating the results of such analyses: most of them regard successful and ongoing projects, whereas failed projects are usually ignored. Also (as noted by The Brookings Task Force on The Internet in "The Economic Payoff of The Internet Revolution", 2001), most of these analyses have been performed by the implementers themselves or by software/consulting-services vendors, and they almost always ignore costs associated with implementing the projects (focusing rather on post-implementation operations). Thus the results of these analyses may be strongly biased, making the projects seem more successful, on average, than they really are.

2. Structure of this paper

"Through 2005, 70 percent of government technology projects that are not supported by a well-developed business case will fail to obtain adequate funding or meet project objectives."[3]

In order to evaluate their projects governments need to determine the necessary efforts and their expected impact. The efforts need to be shaped as **costs** associated with preparing the infrastructure for the project, implementing it and then running and administering the project. On the other hand, the expected impact has two components: the **benefits** that are foreseen to arise from the successful implementation of the project and the **risks** associated with achieving these benefits. Knowing the costs, benefits and risks, agencies can apply the NPV[4] methodology to perform the **valuation** of the project. Such a valuation will also show the strong and week points of the project, allowing us to make several **recommendations** for the policy-maker to improve the value of the project.
The paper will therefore be structured on three levels:

- Elements of the analysis: costs, benefits and risks
- Valuation methodology
- Policy recommendations

A case study will end the paper, to exemplify the methodology.

3. Elements of the analysis

"All states should conduct an exhaustive benefit-cost analysis that incorporates the portal's expected impact on multiple stakeholders prior to engaging in a web portal project."[5]

The analysis compares the costs related to the preparation, implementation and administration of the project, versus the expected impact, reflected in the benefits for various constituencies and discounted with the risks of achieving those benefits. Thus, the elements are:

A. Costs
   1. Pre-implementation: Internal investments for infrastructure and work-process redesign
   2. Implementation: Costs of building the portal
   3. Operational costs: Portal administration and maintenance costs
B. Benefits
   1. Benefits to the governmental agency
   2. Benefits to the citizen/customer
   3. General/mutual benefits
C. Risks
   1. Political risk
   2. Organizational risk
   3. User risk
   4. Technological risk
   5. Vendor risk
   6. Execution risk
   7. Concentration risk

3 B. Keller, "Is IT Worth It? Presenting the Public-Sector Business Case", February 2002 (TU-15-2568)
4 NPV= Net Present Value – an assessment that shows the economic value of current investments based on net future benefits
5 Diana Burley Gant, Jon P. Gant, Craig L. Johnson , "State Web Portals: Delivering and Financing E-Service", Pricewaterhouse Coopers (January 2002)

3.A. Costs

"The construction of a web portal is an expensive undertaking and presents a significant financial and administrative challenge."[6]

Most cost-benefit estimates so far have only considered the operational costs of e-government portals. "Few analysts consider the costs of infrastructure development, integration of cross-boundary transactions with other internal processes, or upgrades when estimating savings, omissions that lead to upward bias in results. [..] Detached, rigorous analysis […] remains rare."[7] This gives a distorted image of the actual cost-benefit ratio, since it ignores the costs of preparing and implementing the project. Since e-government projects are IT intensive, the initial investments are extremely high, and thus they strongly affect the overall profitability of the project. It is therefore important to account for all categories of costs, both initial investments and operational expenses.

There are three major categories of costs:

- Internal investments to move to computerized databases and information management (Prerequisite to a successful digital delivery of government services);
- Costs of building an e-government portal (Implementation costs);
- Portal administration and maintenance costs (Operational costs).

1. Internal investment needs for shifting from paper-based services to a computerized office

"Funding for information infrastructure […] is currently a serious impediment to the development of electronic government." [8]

Internal investments prerequisite to the digitization of services are most often ignored in analyses, although they are likely to constitute the largest expenses, since most governmental services are still paper-based. All public administrations form big and complex organizations, with numerous agencies and offices, employing thousands of knowledge workers, storing hundreds of databases and often performing overlapping tasks.
The main types of expenses will be:

- **Hardware**: servers and workstations, peripherals, networking and communication infrastructure.
- **Software**:
  - General computer operation and communications software, information sharing and data management software
  - Task specific software: database management, ERP, CRM etc.
- **Data digitization** – transferring data from paper files to computer databases can be a lengthy and costly process
- **Personnel**:
  - **Training** – most employees will have to acquire computer operation skills; as new departments are created some will have to transfer and learn new processes and skills
  - **Recruiting** – in many cases, the existing personnel is not ready to adapt to the changes, new people will have to be recruited
  - **Lay-off** – some of the old employees, especially those performing routine tasks, will have to be laid off: compensations offered on this occasion could be costly.
  - **Wage increases** may be required in order to motivate people to accept the changes and then to retain them once they acquire new skills.
- **Organizational and work-process restructuring:**

[6] Diana Burley Gant, Jon P. Gant, Craig L. Johnson , "State Web Portals: Delivering and Financing E-Service", Pricewaterhouse Coopers (January 2002)
[7] The Brookings Task Force on the Internet, "The Economic Payoff of the Internet Revolution", Brookings Institution Press, 2001
[8] ibid.

This may be "the most difficult impediment for e-government", as William Matthews notes. "The governance structures of many governments are not designed to support multi-department initiatives such as e-government," says Judith Carr, vice president and senior program director for Executive Programs at Gartner Inc.[9]

- This may require the use of outside consultants;
- Offices may need to be re-equipped;
- Additional services may be contracted after the restructuring: ISP, IT maintenance and support;
- Outsourcing some of the work is also an option, but it often involves additional expenses (especially on the short run).

2. Costs of building the e-government portal[10]

These represent one-time capital investments and they are usually high (especially for complex portals), but nevertheless much lower than the prerequisite internal investments.

- **Hardware and software** to support the website: servers, server operating software, transmission/bandwidth
- **Design and creation of website**: even if it is outsourced, this process still requires some staff assigned to coordinate development; staff members should also be involved in the testing of the website. All these may lead to increases in staffing and/or wages.
- **Data digitization/migration and integration** between off-line and on-line systems – even if all agencies have transferred their information into computerized databases, a portal will require many of these databases to work together. In the first stage of implementation, new digital and old paper-based databases will have to be used together until all filing and handling is migrated to computerized platforms. Migration and Integration of databases is a difficult and costly process and it often requires the hiring of expensive outside consultants.

3. Portal administration and maintenance costs

Most cost-benefit analyses of e-government only include operational costs related to the processing of the requests posted, or the applications filled in. In addition to these, operational costs should also include the costs of website maintenance and administration.

- **Maintenance and support** – Depending on the complexity of the website, several technical employees will have to provide maintenance and support for the hardware and software used. If these functions are outsourced, their added costs should be accounted for in the analysis and Service Levels Agreements should be included in the contracts.
- **Updating** – website users expect a much higher rate of updating than users of traditional service delivery methods. Updating will be crucial if online transactions are made, since the inflation rate leads to frequent price changes. Information delivery pages will have to be updated often, too. This will require several people to work full-time on updating, while agencies involved need to stay committed to providing the necessary updates in a timely fashion.
- **Modernizing and upgrades** – since the pace of progress in the IT and Internet world is fast and companies upgrade their websites every few years, users will have similar expectations from government portals. Governments will need to add bandwidth, new features, and faster processing capabilities on a yearly basis.

[9] William Matthews, "Study: E-gov prone to falter", Federal Computer Week, May 6, 2002.

[10] For more details on the hardware/software/labor "Costs of an E-commerce Site", see Baseline Handbook Spring 2002, Project Planner Case 001: "E-commerce Sites" (http://www.baselinemag.com/001_planner). The main costs have been attached in Appendix 2. Labor costs should be regarded with caution, since they are specific for the US, and will greatly vary depending on the country where the project is run. However, hardware and software costs are barely influenced by the country of analysis.

- **Security issues** are more serious in developing countries than in developed ones, because of the higher rate of hacker activity (especially in Eastern-European countries). Governments will need to pay special attention to increase the security features of their websites.
- **Marketing and advertising** – since the government has a high response rate from the press, the first few e-government projects are likely to receive wide media coverage, reducing the need for marketing activities. However, as governments launch more such projects, the PR campaigns will lose their effectiveness, and paid-for marketing campaigns will need to be devised. The costs of such a campaign can be quite high, especially if TV ads are used (as was the case of the "e-file" IRS website in the US).
- **Education of the population** on using the Internet and the new government websites: in this respect, again, there are high costs of reaching out to the population. Some of the education will ultimately be performed by non-profits and the private sector, but the costs of this education should still be accounted for. These expenses should become clear once an educational program has been designed.
- **Reaching "universal access"** – poor acceptance and usage by citizens is perhaps the biggest threat to e-government projects, especially in countries with very low Internet penetration rates (e.g. Romania has 3.6% Internet users, as opposed to the US with more than 60%[11]). To reduce this threat governments may provide incentives and subsidies to stimulate the spread of computer and Internet usage. Public access sites are also an option. However, all of these methods are costly, while the threat is serious.

[11] Harvard University, Center for International Development, "The Global Information Technology Report 2001-2002: Readiness for the Networked World", Oxford University Press, 2002

3.B. Benefits

"When citizens and businesses get on-line instead of waiting in line, they can obtain faster, more convenient access to government services, and with fewer errors.[12]"

Previous cost-benefit analyses have mostly focused on the revenues generated through the online channel, ignoring the cannibalizing effect on other delivery channels, while failing to account for the effects on:

- Citizens/customers (time gains, satisfaction with service, increased control over the operations);
- The agency and its employees (improved work efficiency, process automation, less complaints, personnel reduction);
- Society in general (transparency, incentives for increased Internet penetration, increased interaction citizen-government)

Many of these benefits are difficult to predict and quantify, but it is essential to estimate these if we are to perform a complete analysis of the project value.

1. Benefits to the governmental agency

- **Reduce delivery costs** for information and services – this is virtually the only benefit that was accounted for in most analyses done so far. As e-business has proven it before (especially in the field of media and information publishing) the costs of online delivery are lower than those of traditional channels. "Some of the most dramatic reductions in transaction costs, the first category, are found in the differences between web-based and traditional methods of bill payment and document submission."[13] Many analyses so far have determined the average cost of, say, filing a form online compared to filing one in person, on paper, at an agency. This benefit should be easy to estimate if the agency knows the cost of filing in the form in person.
- **Improve work efficiency**:
    - ***Shorten delivery times*** – automation of the filing and verification processes allows the elimination of routine tasks, thus significantly shortening the time spent per form. When designing the website engine, the agency can determine what routine tasks will be eliminated. Knowing the length of each task and its frequency in traditional form processing, the agency can determine the time saved.

Benefit = hourly wages * ? (task length * frequency)

    - ***Reduce crowdedness of government agency offices*** – the number of people who apply in person will decrease by the number of people who apply online. If this percentage is significant, agency offices will have to serve less people than before the project and thus, reduce crowdedness or office space. In the latter case, the cost savings can be estimated based on the rent previously paid for the space saved or using the market price for similar spaces. (In many cases though, the office structure will make it impossible/inefficient to sublet or give up some of the space).

Benefit = % online * total rent for offices

    - ***Reduce personnel***, - if less people are served in person, then less employees will be needed to serve them. This will allow personnel reductions and thus savings on the wages.

Benefit = % online * total wages for customer representatives

    - ***Decrease the number of complaints and the employee-time devoted to handling them*** – since the online form filing gives the user more autonomy and allows more self-service, complaints are usually reduced. The percentage of this reduction should be part of the agency's objectives for the project. The savings can

[12] Al-Kibsi, Gassan; de Boer, Kito, Mourshed, Mona; Rea, Nigel P.; "Putting citizens on-line, not in line", Mc Kinsey Quarterly, 2001, #2

[13] The Brookings Task Force on the Internet, "The Economic Payoff of the Internet Revolution", Brookings Institution Press, 2001

be estimated based on the time spent on complaints and the decrease in complaints for online delivery.

Benefit = % online * % decrease in complaints * total time spent on complaints

- **Faster and improved collection of government revenues.**
  The inconvenience of the traditional revenue collection methods (almost invariably in person) often makes people postpone payments more than they would normally do. At this stage, many people (especially elders, in many developing countries) postpone the payment of taxes until the very last moment, and thus right before the deadline, huge queues start building up at revenue collection offices. The offices can't process all the requests in due time, and thus the government does not collect the revenues in by the deadline (and often ends up extending the deadline). A population survey could help determine the delays in payments caused by the inconvenience of the traditional system.

Benefit = % online * total amount of taxes collected late * average time of delay * interest rate

- **Allows development of new services, integration, and automation.**
  As governmental agencies cooperate to build a common web portal, they will be able to integrate their services in one comprehensive structure. This will allow them to link services as well as data from different forms, and automate some approval processes based on approval of other applications, or cumulative data. They could also devise new services, starting with newsletters and advise on services related to the application (e.g. moving companies for people who apply for address changes, job search websites or re-training programs for people who file unemployment claims), and continuing with innovative services that have no equivalent in the traditional world.
  These benefits are very difficult to quantify before they have been planned for in detail. Furthermore, if the country is only making its first steps in the realm of e-Government, such benefits are only likely to occur several years down the line, after numerous other investments and changes. To assess these benefits, agencies should use this same valuation model for each new service they plan to add.
- **Creates opportunities for new revenues** from advertising banners ("Americans would rather see advertising on government Web sites than be charged convenience fees."[14]), links to other websites (see previous point about new services), subscriptions to specialized services/information etc. These are likely to bring some additional benefits, but the e-business experience has proven that revenues obtained this way are usually small. The revenues will be highly correlated with the number of users for the website.

Benefit = number of website visitors * ad market rate per visitor * # of ads

2. Benefits to the citizen/customer

"Citizens and business save on the costs of compliance including search costs, travel costs […], repetitive entry of information, verification of task completion […]. E-government best practice examples strive to increase responsiveness to clients by eliminating process steps, redundancy, and confusion for the user."[15]

These benefits have rarely been evaluated as part of cost-benefit analyses in the past, and they are difficult to predict and, even more so, to quantify.

The main benefits to the citizens are:

- **More self-service** – the citizen escapes the bureaucratic loop, which in many cases makes it almost impossible (and highly time-consuming) to get the desired services, especially in the case of approvals.
  The citizen gains more control as well as a better view and understanding of governmental services. This leads to a significant decrease in time spent on applying for the desired services, and in the frustration associated with this process.
  To determine the time savings resulting from the project, agencies should determine the time spent in person on filing for a certain service (through surveys or process measurements) and estimate the time needed online for the completion of the respective forms (in this case, results from other similar projects can be used as a guideline).

14 Dibya Sarkar, "Survey: Ads better than fees", Federal Computer Weekly, Sept. 21, 2000
15 The Brookings Task Force on the Internet, "The Economic Payoff of the Internet Revolution", Brookings Institution Press, 2001

Benefit = % online * (average time spent in person – time spent online) * average wages

- **Customer (citizen) satisfaction**:
    - *Easy, 24x7 access* (people who file/apply after business hours/during breaks also save time for their business/employer)
    - *Better and more information* (the number of visitors/downloads should be forecasted and compared to historical paper-based information delivery; market prices for similar books/directories could be used to determine the value of information),
    - *Cheaper service* is often cited, but this remains a question mark (it was also highly acclaimed in e-business). Ultimately, it is the profitability of the project that will allow (or not) for price reductions. Cheaper service, if reached, is the effect of all other benefits already accounted-for.
    - *Integrated services, avoiding repetition of processes* - These benefits are difficult to quantify and will only occur in a later phase of e-government, when services are correlated and integrated in one portal.

3. General/mutual benefits

- Transparency, decreasing of bureaucracy
- Better relationship between government and customer; more interaction and feedback
- High-value web content will provide additional incentives for people to use the web, leading to an increase in Internet penetration rates. "In addition to transaction cost savings, positive network externalities associated with Internet penetration increase the estimated savings."[16]

These benefits are hard to forecast or quantify and they require correlated transformations in other fields (e.g. inter-agency cooperation, customer oriented service, more responsive government) in order to take effect. However, they should be accounted for in a qualitative manner, after the cost-benefit analysis, if they match the overall political and economic objectives of the government.

[16] The Brookings Task Force on the Internet, "The Economic Payoff of the Internet Revolution", Brookings Institution Press, 2001

3.C. Risks

"More than 60 percent of e-government initiatives fail, or fall short of their objectives."[17]

A risk assessment should also be performed, analyzing all types of risks associated with such e-government projects[18]:

- **Political risk:**

It is often the case in public administration that sound projects do not get implemented due to lack of political support. In many cases, the agencies that need to participate in the building of a portal do not cooperate. In other cases, even for one-agency projects, the budget for that agency's IT spending may be reduced unexpectedly (see this year's IT budget cuts as a response to the recession).

A huge risk often lies in the change of government after elections. The case of Chile is very relevant in this respect: a growing and very successful e-procurement project was abandoned soon after the new administration has set foot, making the investment in the project virtually useless.

Failure or relinquishment of the project can void all expected future benefits

- **Organizational risk:**

Even if there is political support for the project, work-process changes within the agency, retraining and re-staffing programs pose serious challenges on employees. In many cases of transformation within the public sector, employees have resisted the changes and have significantly delayed the implementation. The risk increases significantly as the use of technology threatens them to loose their jobs[19].

Employees may also have real difficulties working with the new system. Since most routine tasks become automated, employees will have to shift the focus of their work from these tasks to more substantive and information-intensive tasks. They may also need to learn how to operate computers, work with databases etc. This is often a difficult task, and some workers will most likely oppose or dislike the changes.

This risk can lead to increased internal investment costs, and decrease benefits from personnel reductions.

- **User risk:**

Users may not embrace the new delivery method, and this can lead to very low adoption rates. The possible reasons for such failure are numerous:

- Lack of Internet access,
- Very slow connections,
- Lack of Internet navigation/Computer operation skills,
- Issues of security or privacy,
- Payment methods (e.g. Romania still hasn't developed a convenient and wide-spread online payment method).

A low level of user acceptance can significantly decrease all the benefits derived from the projects.

- **Technological risk:**

As the Web is a relatively new technology in use and other new standards/protocols are constantly developed, the Internet changes its face and, even more, its platforms. Government, as well as business, websites built 3-4 years ago are completely outdated and unattractive today. But in some fields (online collaboration, knowledge sharing, entertainment services) the last 1-2 years have brought major changes.

[17] William Matthews, "Study: E-gov prone to falter", Federal Computer Week, May 6, 2002.

18 The typology of risk presented below is based on a risk assessment model used by Gartner, Inc.: B. Keller, "Is IT Worth It? Presenting the Public-Sector Business Case", February 2002 (TU-15-2568)

[19] Due to strong opposition, laid-off employees in Eastern-European countries often receive a compensation equivalent to their 6-12 months wages.

Such changes can make an e-government investment obsolete in a matter of months *leading to higher costs for modernizing and upgrades*.

- **Vendor risk:**

All of the hardware and most of the software required for e-government projects are likely to be outsourced from either local or multinational vendors. But in a fast-moving industry like IT, the life span of companies is often short and recession/technological progress can drive companies out of the market.
Small local companies seem to be the most prone to this type of risk. However, there are numerous risks for big multinational companies too: Compaq, who is one of the main IT vendors for the Romanian government, will soon be acquired by Hewlett Packard and acquisitions often lead to the elimination of redundant product-lines/services/management employees etc. – such changes could seriously affect the quality of service received for the technology acquired from Compaq.
This can increase maintenance and support costs.

- **Execution risk:**

The risks associated with the project implementation (failure to gather people and funding, cash-flow issues, not meeting deadlines, exceeding the budget etc.) are often ignored.
E-government often takes more money, planning, leadership and sustained focus than government officials anticipate, and without those key ingredients, e-government initiatives are likely to falter.[20]
This can significantly increase the costs of building the e-government portal.

- **Concentration risk:**

Agencies sometimes over-emphasize the importance of a certain e-government project, in order to obtain the necessary support or funding. If that project fails, such failure can generate extreme disruptions, leading to complete lack of support and funding for similar projects in the future. Thus, public agencies need to ask themselves whether they are concentrating too much on one project, or drawing too much attention to it (from politicians, the public, or even employees).
This risk is difficult to quantify, and it often affects future projects more than the current one.

[20] William Matthews, “Study: E-gov prone to falter”, Federal Computer Week, May 6, 2002.

4. Evaluating the project

"To be effective, a methodology for measuring the value of e-services must be developed based on an awareness of the environment in which it must function."[21]

The purpose of this valuation is to provide an accessible selection criterion for determining the opportunity of e-government projects in developing countries.
Traditionally, project value is assessed using the Net Present Value (NPV) method, which accounts for the net benefit occurring from the project during its lifetime. Such analyses are not easy to perform and many debates have surrounded the methodology and the quantification of non-monetary effects. However, the NPV analysis is ideal for showing the economic/financial value of a project.
While the NPV is widely used in business analyses, government projects are somewhat more difficult to evaluate, as the government's mission is broader than just "to maximize value for shareholders". And e-government projects are among the most difficult to evaluate:

> *"When the question was whether to build a highway over the mountains, it was pretty easy to calculate the cost of the project vs. the benefit to society, Jerry Mechling says. The savings in fuel and time, improvements in safety, even the probable increase in commerce could be compared against the cost of the road with relative ease." However, professor Mechling argued, the complexity and the wide reach of e-government demand a more complicated analysis.*[22]

Prof. Mechling and Booz Allen Hamilton have devised a complex Value Measuring Methodology for e-services[23]. It adds several dimensions (political, social, operational etc.) to the economic value assessment. The state of Iowa has chosen a somewhat simplified version for its assessment of e-government projects[24] and Gartner[25] suggests a similar scoring system. These methodologies cover more than just the economic value of the projects, but their implementation tends to be quite difficult and they have yet to prove their real-life applicability[26].
Considering the difficulties in using such complex valuation methodologies, corroborated with the lack of coordination and consistent data across agencies in developing countries, a simplified valuation method is more desirable[27].

This method will allow government agencies to identify (and possibly eliminate or postpone) loss-making projects from the very start. On the other hand, it also helps building the case for profitable projects in order to receive financing.
The NPV methodology:

1. **Establish a time frame**: the first step is to determine the life span of the project. In the case of IT investments, this should be much shorter than for most government projects. In e-commerce and similarly in e-government, websites need to be modernized and upgraded every 3-4 years. Since the pace of change in developing countries is faster, the projected life span of the project should be about 3 years.

[21] Mechling, Jerry, "Building a Methodology for Measuring the Value of E-Services", Booz Allen Hamilton – Final Report for the Social Security Administration, April 2002
[22] William Matthews, "Measuring e-gov", Federal Computer Week, April 8, 2002
[23] Mechling, Jerry, "Building a Methodology for Measuring the Value of E-Services", Booz Allen Hamilton – Final Report for the Social Security Administration, April 2002
[24] http://www2.info.state.ia.us/roi/
[25] C. Baum, "Prioritizing E-Government Projects", 5 February 2002 (DF-15-3135)
[26] "One of the issues we need to find out through testing is whether it is simple enough to be usable," says Tony Trenkle, from the Social Security Administration, in an interview with the Federal Computer Week.
The main difficulties: these analyses require the evaluation and quantification of a large number of qualitative aspects, which are then translated into a normalized score. Due to the scoring methodology, this type of valuation also requires its usage on all e-government projects, if comparisons are to be made.
[27] Of course, analyzing additional dimensions (once the project has shown a positive value) is highly desirable, though sometimes difficult to achieve. Some aspects to consider are: stakeholder perspectives (who will support/oppose the project); social value; political value; exportability to other agencies.

2. **Quantify benefits:** project goals should be translated into forecasted benefits, and then quantified based on the guidelines presented above. To simplify the analysis, the quantification should be done in constant prices – it is often easier to use a very-low-inflation foreign currency (like USD), especially when most technology prices are expressed in that currency.
3. **Determine costs:** Initial investments should be estimated first. Further funding needs should also be estimated, as well as operational expenses. All costs should be expressed in the same currency (constant, same year's) as the benefits. Costs should also be adjusted with the corresponding risks. Both benefits and costs should be estimated at least on a yearly basis (quarterly or monthly estimates would make the analysis more rigorous, but require a very detailed forecast).
4. **Determine terminal value:** At the end of the project life span, major new investments should be expected, the technology is likely to be replaced and the portal could be completely redesigned. But even so, some value still remains: databases created, employees trained, work processes restructured etc. Future e-government projects will often build on this foundation. Therefore, at the end of the project life span, these benefits need to be identified and quantified.
5. **Determine discount rate (r):** While in the private sector there are several ways to determine the adequate discount factor (usually based on the cost of capital), it is quite difficult to determine the discount rate for the public sector, especially when the agency doesn't issue bonds. To determine the rate, one can use the interest rate for public debt for the country as a starting point (e.g. if the government can borrow at a 13% interest rate, an appropriate discount rate could be 15-20%). Since it is difficult to determine the right discount rate, a sensitivity analysis should be performed (e.g. two scenarios, one for 15%, another for 20%).
6. **Discount based on time of occurrence and determine NPV:**

$$NPV = ? (B_i - C_i)/(1+r)^i$$

with i=0 to n (n being the project life span, e.g. 3 years)

3. Recommendations

There are several basic recommendations that can be made right away:

1. Develop a detailed, rigorous analysis:

In order to determine the real value of the project, the project must be well thought-through. The planning stage becomes essential, as it provides the data on which the valuation is based. The agency should establish detailed objectives, milestones and success criteria for the e-government projects.

2. Evaluate the project during and after implementation:

This will allow for adjustments and improvements, increasing the chances of successful deployment. It will also show the effectiveness of the pre-implementation assessment, offering guidelines for future evaluations.[28]
Build a task force (that could include all stakeholders: government, community, business, technology experts etc.) to analyze the opportunity of e-government initiatives.[29]

3. Take actions that could improve the impact of e-government projects:

- Cost reduction:
    - Leapfrogging – implement the most modern and most integrative solution: skip quick-fixes (requires huge coordination efforts and leadership)
    - Stick to the impact-maximizing actions: provide only the most required/used services, postpone other services until the market is ready (Pew survey: "The rise of the e-Citizen"[30] shows how most people use the internet nowadays – the most requested services should be selected)
    - Focus on services for large businesses (most have internet, and allow for scale economies) – see the wide success of e-procurement projects
    - Devise royalty-based contracts with providers of hardware and software to avoid sunk costs and project risks
- Extending the benefits
    - Reach out to a larger constituency – rather than choosing certain segments (e.g. business), extend the services to attract as many customers as possible, in order to benefit from economies of scale (should be correlated with integration and leapfrogging, thus requiring significant efforts)
    - Encourage the expansion of internet and computer usage: public access, free up telecom market, incentives for ISP/IT investments (this could prove quite expensive, therefore a critical cost-benefit analysis should be performed again)
    - Develop new services, provide links to related, profitable (even private) services – this could add new sources of revenues, especially since government portals are likely to attract huge numbers of visitors

[28] For additional details on metrics, see guidelines from Gartner, Inc. in Appendix 1.
[29] Gartner: B. Keller, "Developing Technology Impact Indicators in Seattle", December 2001(Case Studies: CS-14-8424)
[30] see Appendix 3: Pew Internet & American Life Project Government Web Site Survey, September 5-27, 2001

5. Case study: e-tax in Romania

E-tax[31] is one of the first Romanian e-government initiatives that goes beyond the publishing of information online.

"The payment of taxes through electronic means represents a solution that would make more efficient the process of collecting the financial dues from the population, thus eliminating the long waiting hours in front of the tax-offices at the level of the local administration, reducing the bureaucracy and offering the possibility of a modern and civilized interaction between citizens and authorities" (Dan Nica, Romanian Minister of Communication and IT)[32].

"The solution proposed by MCTI is based on the creation of a portal so that the taxes can be paid via the Internet. Assisted by this portal, the payers are constantly informed about the current debts that they have to pay to the financial administration, they may establish the amount of a payment and pay the taxes by electronic means. The payer is given the confirmation of the e-payment in the form of a confirmation receipt signed electronically, which should identify the tax payer - as it is found in the financial administration database, the beneficiary of the payment, the number of transactions made for getting information on the debits and the payments, and the details of the effected operations. The prototype system of e-Tax deals securely and confidentially with any information from the financial administration systems and from the systems of the bank that is in charge of the payment."[33]

Cost-benefit analysis:

We will estimate value of implementing this project in the city of Bucharest.

A. Costs:

In estimating the costs, we have assumed no internal investment costs, since no data about the extent of these investments was available.

In estimating the costs of building the portal we have assumed that there will be no integration with the previous databases (in case they exist) or digitization (if still filed in hard-copy)

We will also assume that media coverage for the project will cover the marketing needs (since e-government projects are still a major news in Romanian press). Also, population-education and universal access would not be tackled at this point, but rather in a more advanced stage of e-government.

The press releases and the prospectus of the pilot program emphasize a high concern for security issues, so we will assume that those have also been addressed.

The cost of the software will probably be about $100,000 (based on Dan Nica's estimates and the cost of the pilot program).

Main costs:

[31] The following case study is designed for the sole purpose of offering an basic example of analysis. The numbers shown should not be interpreted as exact figures and the final result of the case study analysis should not be interpreted as being a valuation of the actual project.
Some of the data used is real, but since detailed project information from the Romanian Ministry of Communication and IT was not available, some figures represent assumptions and in several cases no costs were assumed, although a detailed plan would probably prompt to them.

[32] http://www.mcti.ro - "E-Tax" Press Release, January 18, 2002

[33] ibid

INFRASTRUCTURE		Costs
Production Server Hardware (with bundled software)		**$ 26,500**
	Web servers (1)	$ 5,000
	Application servers (1)	$ 9,500
	Database servers (1)	$ 12,000
Development Server Hardware (with bundled software)		**$ 12,150**
	Backup server	$ 3,250
	Laptops and desktops	$ 2,400
	Development servers	$ 6,500
Network Hardware		**$ 80,000**
	Routers	$ -
	Switches (1)	$ 2,500
	Load-balancing systems (1)	$ 32,000
	Firewalls (1)	$ 6,000
	Backup system	$ 32,500
	Other security expenses	$ -
E-Tax software		**$ 100,000**
Labor Costs (fully burdened costs, including benefits, bonuses, training, T&E)		**$ 39,600**
	Planning staff (requirements development)	$ 700
	Technical staff (planning and engineering)	$ 2,500
	External contractors/consultants	$ 36,400
Managed Hosting Costs Prior to Site Launch		**$ 5,000**
Overhead During Development (e.g., HR, Legal, Finance)		**$ 400**
STARTUP COSTS (minus hardware)		**$ 45,000**
STARTUP COSTS (hardware & software)		**$ 218,650**

Capital		**$ 30,600**
	Hardware maintenance	$ 500
	Hardware upgrades	$ 1,600
	Software maintenance	$ 500
	Software upgrades	$ 3,000
	Post-launch hosting expenses	$ 25,000
Labor Costs (Fully burdened costs, include benefits, bonuses, training, T&E)		**$ 18,000**
	Business staff (ongoing enhancements)	$ 4,000
	Systems administrators	$ 7,200
	Technical staff	$ 4,800
	Operations staff	$ 2,000
	External contractors/consultants	$ -
OPERATING COSTS (first year)		**$ 48,600**

B. Benefits:

Assumptions:

- 1.5 million taxpayers (based on 2.5 milion people living in Bucharest)
- 10% average Internet penetration (next 3 years) – 150,000 likely users
- average total taxes per person per year = $200
- Average wages = $2000/year or $1/hour
- 100 full-time customer service representatives dealing with traditional tax payments

Then:

Delivery times shortened from 1 hour/person to 0.5 hours. Times 150,000 users → user savings of $75,000 per year. Assume 33% move to filing after business hours → additional savings of $25,000 per year.
Crowdedness of offices not transferred into saved space/rent, due to low number of users
Reduce personnel by 10% (10 people laid off at zero cost) = savings of $20,000 per year
Faster revenue collection: 5% of tax revenues collected traditionally = 1 month late at 1% per month interest rate → $15,000 per year in savings.
No significant advertising revenues.

C. Risks:
Assume 10% **political risk** that the project will be abandoned after 2004 elections (no benefits for year 3). Therefore discount year 3 benefits by 10%.
Assume **execution risk** increases cost of deployment by 5%.
Assume all other risks are zero.

Evaluating the Project:

Time frame: 3 years
Assume Terminal Value of 20% of startup costs (including hardware : $50,000
Assume discount rate: 20%

	Initial	y1	y2	y3	Terminal value	Total
Cost	277	49	49	49		
Benefit	0	135	135	135	50	
Net benefit	**-277**	**86**	**86**	**86**	**50**	
Discount factor	1.00	1.20	1.44	1.73	2.07	
Present (discounted) value	***-277***	***72***	***60***	***50***	***24***	***-72***

NPV of e-tax	**-72**

Our analysis shows that the project has a negative economic value and some of the recommendations in section 5 should be taken into account to improve the impact of the project.

Appendix 1

Measuring e-government

Listed below are some metrics to help measure the impact of e-government projects:

Gartner[34] recommends the following types of metrics for determining e-government success:

- **Administer stakeholder satisfaction and value surveys before and after service delivery.** Survey external constituents, political leaders, and employees and contractors that deliver support services (e.g., contact centers). Measure stakeholder perception of privacy and security.
- **Quantify Web channel usage relative to other channels (e.g., walk-in, phone or mail).** Have targets been set, and has usage met those targets?
- **When are Web channels being utilized?** Has the need for 24x7 support materialized? Beyond initial availability, have services continuously been available?
- **Analyze costs and improved service for delivering services over each channel.** Has the Web channel decreased costs or time to deliver services relative to traditional channels?
- **Itemize the extent that processes have been improved by delivering them via new channels.** Have unnecessary steps been removed? Have resources been redistributed to other areas?
- **Identify how government has been transformed.** Has e-government service delivery resulted in multi-department or cross-sector (state, local or federal) collaboration? Has the customer's need to know organization structure disappeared? Have multi-department or jurisdiction data standards been created? Are shared services such as common payment process, e-mail and authentication deployed, and are multiple departments using them?
- **Is e-government marketing used on Web sites, in the press and in public places?**

[34] Gartner: G. Kreizman, A. Di Maio, "E-Government Study Gauges Service Breadth, Not Success", November 2001 (E-14-7354)

Appendix 2

Costs of building an e-commerce website

INFRASTRUCTURE		Costs
Production Server Hardware		**$ 70,500**
	Web servers (5)	$ 26,000
	Application servers (2)	$ 19,500
	Database servers (2, clustered)	$ 25,000
Production Server Operating Software (if not bundled with hardware)		**$ -**
Development Server Hardware		**$ 58,500**
	Backup server	$ 3,250
	Laptops and desktops	$ 48,750
	Development servers	$ 6,500
Development Server Operating Software (if not bundled with hardware)		**$ -**
Network Hardware		**$ 115,050**
	Routers	$ -
	Switches (2)	$ 4,550
	Load-balancing systems (2)	$ 65,000
	Firewalls (2)	$ 13,000
	Backup system	$ 32,500
	Other security expenses	$ -
Transmission/Bandwidth Charges Prior to Launch (if not bundled with Hosting)		**$ -**
Facilities/Equipment (to house servers and infrastructure staff) **or Rent Expense Prior to Launch**		**$ 13,000**
Labor Costs (fully burdened costs, including benefits, bonuses, training, T&E)		**$ 124,800**
	Business staff (requirements development)	$ 13,000
	Technical staff (planning and engineering)	$ 39,000
	External contractors/consultants	$ 36,400
	AND/OR Systems integrators	$ 36,400
Managed Hosting Costs Prior to Site Launch		**$ 13,000**
Corporate Overhead Chargeback During Development (e.g., HR, Legal, Finance)		**$ 6,240**
STARTUP COSTS (minus hardware)		**$ 157,040**

Capital		**$ 159,900**
	Depreciation of server hardware (if not expensed at startup) per year	$ 45,500
	Depreciation of network hardware (if not expensed at startup) per year	$ 39,000
	Hardware maintenance	$ 3,250
	Hardware upgrades	$ 3,250
	Software maintenance	$ 1,950
	Software upgrades	$ 1,950
	Bandwidth/transmission charges (if not bundled with hosting)	$ -
	Post-launch hosting expenses	$ 65,000
Labor Costs (Fully burdened costs, include benefits, bonuses, training, T&E)		**$ 204,750**
	Business staff (ongoing enhancements)	$ -
	Systems administrators	$ 81,250
	Technical staff	$ 81,250
	Operations staff	$ 42,250
	External contractors/consultants	$ -
OPERATING COSTS (first year)		**$ 364,650**

Appendix 3

Pew Survey of Government Websites

What most people do:

Activity	% of people surveyed
Get tourism and recreational information	77%
Do research for work or school	70%
Download government forms	63%
Find out what services a government agency provides	63%
Seek information about a public policy or issue of interest to you	62%

Source: Pew Internet & American Life Project Government Web Site Survey, September 5-27, 2001. N=815. Margin of error is ±4%.

What they do least:

Activity	% of people surveyed
File your taxes	16%
Renew a driver's license or auto registration	12%
Renew a professional license	7%
Get a fishing, hunting or other recreational license	4%
Pay a fine	2%

Source: Pew Internet & American Life Project Government Web Site Survey, September 5-27, 2001. N=815. Margin of error is ±4%.

Bibliography

Crouch, Edmund A.C.; Wilson, Richard; "Risk/Benefit Analysis", Ballinger Publishing Company, Cambridge, MA, 1982

Irvin, George, "Modern Cost-Benefit Methods – An Introduction to Financial, Economic and Social Appraisal of Development Projects", Barnes and Noble, New York, 1978

Schmidt, A. Allan, "Benefit-Cost Analysis – A Political Economy Approach", Westview Press, Boulder, 1989

Rosen, Harvey S., "Public Finance", Richard D.Inrwin Inc., 1995

Brealey, Richard A.; Myers, Stewart C.; "Principles of Corporate Finance", McGraw Hill, December 2000

McKinsey & Company, Inc. (Copeland, Tom; Koller, Tim; Murrin, Jack), "Valuation", Jon Wiley & Sons, Inc., 2000

The Brookings Task Force on the Internet, "The Economic Payoff of the Internet Revolution", Brookings Institution Press, 2001

Fountain, Jane E., "Building The Virtual State: Information Technology and Institutional Change", Brookings Institution Press, 2001

Osorio, Carlos A., "Alignment of Readiness Factors for e-Government" – working paper, Information Technology Group at the Center for International Development, Harvard University, 2001

***, Baseline Magazine, Ziff Davis Media, April 2002

http://www.fcw.com - Federal Computer Weekly

http://www.govebiz.com - Government E-Business

http://www.mcti.ro - Romanian Ministry of Communication and Information Technology

Mechling, Jerry, "Building a Methodology for Measuring the Value of E-Services", Booz Allen Hamilton – Final Report for the Social Security Administration, April 2002

The Center for Digital Government nominates yearly the best state portals: http://www.centerdigitalgov.com/

Deloitte Consulting: http://www.dc.com/

McKinsey & Co. http://www.mckinseyquarterly.com/

http://www.cid.harvard.edu/cidglobal/compet.htm

Similar tools are used in some of the World Bank reports, both on technology and development.

Price Waterhouse Coopers report: "State Web Portals: Delivering and Financing E-Service"