A Cost-Benefit Analysis of the Seoul OPEN System: Policy Lessons for Electronic Government Projects

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Abstract

This paper uses a case study to illustrate how political bias in cost-benefit analysis (CBA) affected an electronic government project, the OPEN System, in Seoul, Korea. A conceptual cost-benefit framework is developed to comprehensively assess the costs and benefits categories associated with electronic government projects, and to compare it against the politically biased analysis. CBA depends largely upon analysts' view on the costs and benefits of a project. Most electronic government projects are analyzed by the politicians' view, which can depart from the normative assumptions of standard CBA to reflect the viewpoints of affected key constituencies. This biased view tends to inflate benefits and to underestimate costs by ignoring major costs. By comparing the two CBAs with different viewpoints, I am able to show how politicians' lens erroneously analyzes electronic government projects, overlooking key issues, such as security, privacy, and equity (digital divide).

1. Introduction

Since the 1990s, information technology (IT) has been widely applied to all levels of government in many countries. Underlying this trend is the rosy expectation that IT applications are able to improve efficiency, accessibility, transparency, accountability, and responsiveness in the public sector. Many scholars agree on this expectation, insisting that IT could play a crucial role in reforming governments, whereas others doubt its effectiveness, even claiming "Information Technology failures" or "productivity paradox" (Northrop et al. 1990; Brown and Brudney 1998; Dedrick et al. 2003). Are electronic government (e-government) projects really beneficial and worth tremendous resource allocation?

Despite some criticisms, cost-benefit analysis (CBA) is widely used in the intellectual and practical world (King and Schrems 1978; Frank 2000; Kornhauser 2000). This technique provides decision-makers with costs and benefits information of public projects in a clear and conceptually consistent manner. However, CBA is not a panacea; even proponents would admit that CBA is an analytic tool, not a definitive decision-making guide. In Downs (1967)' term, the "power payoffs" of IT applications tend to be less considered because of preoccupation with "technical payoffs." [1] Furthermore, CBA depends on how analysts view the costs and benefits of a project. Therefore, decision-making and evaluation of IT projects in the public sector call for careful consideration of CBA lenses.

The purpose of this paper is threefold: 1) to illustrate how the pervasive CBA lens, spenders' perspective, analyzes e-government projects, 2) to examine common problems of this spenders' CBA by comparing with the standard CBA, and 3) to draw policy analysis lessons for e-government projects.

This paper begins with contrasting spenders' CBA lens with the standard analysts' perspective. Section 3 discusses major issues to be considered in e-government projects. In section 4, the background of the Seoul OPEN System is summarized. From the standard CBA perspective, section 5 and 6 respectively analyze the costs and benefits of the old application handling process and the Seoul OPEN System. Then, I will examine how appropriately the Seoul Metropolitan Government considered the costs and benefits of the OPEN System in section 7. Section 8 provides a standard CBA of the ideal OPEN System to illustrate an exemplary IT application project. Finally, I conclude with policy lessons for IT projects in the public sector.

2. CBA of electronic government projects

In general, policy analysis is client-oriented, reflecting relationship between analysts and their clients (Weimer and Vining 1998). The CBAs of public projects are made under political environments (King and Schrems 1978). The regular clients of most IT projects are politicians and elected top executives (i.e, mayor), who have short-term political interests and often want to use CBA to justify the projects in favor (Wildavsky 1966). They can get positive power payoffs from IT applications that provide enhanced

[1] Final payoffs consist of technical payoffs and power payoffs. The former captures typical costs and benefits of technical improvement (e.g., efficiency and productivity), while the latter is "redistribution of the benefits of decision-making" or shift in relative power.

controllability over organizations (subordinates). (Downs 1967; Kraemer and Dedrick 1997).

As a widely used policy analysis tool, CBA largely depends upon the perspectives from which analysts view costs and benefits of projects. Based on the bureaucrats' roles, Boardman et al. (1993) grouped bureaucratic CBA perspectives into guardians, spenders, and analysts' lenses. These lenses perceive costs and benefits in different ways, often yielding different conclusions.

Guardians' view tends to "equate benefits with revenue inflows and costs with revenue outflows." This controllership oriented lens engages in revenue-expenditure analysis, ignoring nonfinancial benefits and opportunity costs. Spenders' lens regards "expenditures on constituents as benefits and expenditures by constituents as costs." This "constituency-support" perspective treats inputs as the appropriate measure of benefits, ignoring sunk costs and opportunity costs of government-held assets. Unlike guardians, spenders favor a low discount rate to support projects in hand by overestimating their benefit-cost ratios. Finally the analysts' lens refers to the standard CBA perspective, which evaluates the costs and benefits of a project in the strict economic sense.

The CBAs of e-government projects under political environments tend to be dominated by the "constituency-support" view rather than the standard CBA perspective. This spenders' CBA by and large corresponds to politicians' preference, which pays more attention to the concentrated benefits and dispersed costs rather than allocative efficiency (Boardman et al. 1993). Unfortunately, this is a "real politick" rather than an abnormal.

In the real world, costs tend to be difficult to control due to endemic "runaway costs" and benefits are difficult to achieve (King and Schrems 1978). To make it worse, the spenders' perspective fails to provide decision-makers and citizens with relevant costs and benefits information of e-government projects. Its analytic biases tend to overestimate benefits and underestimate costs by erroneously dropping significant costs (Boardman et al. 1993). This CBA also tends to overlook key issues in e-government projects, such as security, privacy (confidentiality), disproportional distribution, and equity (digital divide). From the standard CBA point of view, therefore, this spenders' CBA is just misleading.

3. Issues in e-government projects

What kinds of costs and benefits must to be taken into account in e-government projects? This section discusses major issues in e-government projects with focus on their costs and benefits. The e-government here, as in the Electronic Government Act of 2001, denotes the use of web-based IT applications in governments.

3.1. Efficiency

Efficiency is the most important rationale of adopting IT applications in the private and public sectors. IT applications allow people to overcome the limitations of time and physical distance. These applications can process and transfer large data quickly so that governments are able to avoid workforce expansion, and to speed up the transactions and service delivery. As such, IT has been expected to transform organization structures and the ways of doing business through process innovation. Two kinds of efficiency are considered here.

The first is citizens' efficiency. IT applications are efficient if citizens do not need to visit the city hall or call civil servants to check what is going on, or if they can get their applications done faster with less trouble. Assuming the status quo baseline, efficient IT applications can save citizens' time, money, and energy by internalizing the costs in governments. Politicians and elected executives, who are likely to be responsible to the short-term interests of the voters, resort to this efficiency that is often appealing to their constituents (King and Schrems 1978). This citizens' efficiency is not necessarily in accord with the administrative efficiency of governments.

Governments may perceive the internal efficiency as the extent that e-government applications can reduce labor and capital for doing the same level of businesses as before. However, e-government applications do not necessarily entail reductions in budgets and manpower, unless they are involved in government-wide process innovation for enhancing productivity. Accordingly, most IT applications tend to assist or replace existing processes without substantial changes in labor and capital, or to create new services that necessitate additional revenue expenditure. This is the case especially when the IT applications, like the Seoul OPEN System, are aimed at other purposes (e.g., transparency and responsiveness) rather than efficiency. Politicians and elected executives tend put more emphasis on citizens' efficiency rather than internal administrative efficiency, since what they actually need is the "appearance of productivity and efficiency" (King and Schrems 1978).

IT applications may incur inconvenience and anxiety on civil servants. However, these negative effects, if any, should not be considered costs of e-government applications, unless they accrue actual, economically meaningful costs. They may indirectly express employees' unwillingness to adopt IT applications, reveal officials' "play-it-safe" or lazy attitudes to work. For instance, seventy two percent of civil servants in the 2001 survey were complaining additional workload incurred by the OPEN System. But this complaint or just whining did not affect government efficiency since it did not entail increase or decrease in labor and capital.

Similarly, it is reasonable to assume that speeding up application handling processes does not affect

governments' internal efficiency, although improving applicants' efficiency. What the bribees (i.e., corrupt officials) need to do is to handle the application first even when it was submitted later, to avoid any unnecessary (or intentional) delay, or to shorten the process. Doing illegal actions does not require additional employees or capital. Therefore, administrative corruption and complaints about IT applications are not directly related to administrative efficiency from the standard CBA perspective.

3.2. Public goods

E-government applications are commonly aimed at improving public trust, openness, accessibility (universal access), transparency, accountability, and responsiveness. These are public goods that widely affect every stakeholders (i.e., citizens, top executives, and civil servants). Individual IT applications have their own primary objectives. For instance, an IT application for procurement may put more emphasis on efficiency and transparency, while an online license renewal application may focus more on responsiveness and accessibility. Tax filing IT applications (e.g., IRS Free File) may care more for transactional efficiency. The Seoul OPEN System was initiated to improve openness and administrative transparency.

It is difficult to measure the magnitudes and changes of these public goods. The economic valuation of intangible benefits remains one of the critical issues in CBA. However, public goods should be incorporated in the policy analysis regardless of measurement problems. They should be accounted for citizens rather than others. In fact, top executives may get substantial political gain from the implementation of IT applications. However, these power payoffs, although rarely captured by CBA, should be viewed in terms of the redistribution of relative powers among politicians, legislators, bureaus (departments), and civil servants (Downs 1967).

3.3. Corruption

One of the significant public goods benefits of IT applications is corruption prevention. Administrative corruption occurs when government officials illegally exchange public properties or services with private gain (i.e., bribe) in the course of performing their duties. But it is not easy to measure the degree of corruption because corruption is observed only when it is discovered.

The effect of corruption is not always negative. There are positive economic benefits for those who involve in the illegal exchange. If time saving benefits of accelerating application handling processes are larger than bribe, applicants will offer bribe to the civil servant in charge. The amount of bribe represents the willingness to pay of an applicant. As such corruption can improve economic efficiency and social welfare in a sense that it can allocate resources efficiently.

However, it is obvious that corruption has negative impacts on society as a whole. Corruption scandals reduce trust of citizens in governments. In fact, one major purpose of the OPEN System was to attenuate citizens' anger at bribery scandals of senior officials, thus to recover the public trust. Mayor's strong initiative and commitment to the OPEN System implies such a political value, as opposed to economic value, in the IT application project. Corruption obviously does harm not only the public, but also governments and mayors.

3.4. Privacy and security

IT applications are double-edged in the sense that their information processing ability and accessibility can boost productivity, while inevitably raising the risk of privacy and security at the same time. These private information protection (confidentiality) and system/data security become increasingly important in the public sector, but their costs tend to be less considered, if not ignored, in IT projects.

Any IT applications, at least to some degree, are always exposed to potential attacks from hackers or crackers (e.g., worms and viruses), internal and external computer criminals, and natural disasters (e.g., earthquake, fire, and flood). In particular, insidious worms and computer viruses have caused wide and enormous damage. Accordingly, the costs of ensuring system and data security (e.g., firewall, authentication, and virus protection) are growing rapidly.

On the other hand, IT applications can handle and transfer much private information fast at the risk of leakage and misuse of the information. This privacy problem indeed is detrimental to the general public, although making illegal private information users better off sometimes. In order to manage privacy and confidentiality, restricted data and restricted access are often considered (Duncan 1999). The former technically limits the range and format of information to be disclosed, while the latter imposes differentiated access restrictions on users. This privacy ensuring cost is also increasing in proportion to openness and technology progress.

3.5. Characteristics as a system

An e-government application is a system (package) whose components (i.e., computer hardware, software, human, and institutional factors) should be appropriately arranged and connected; otherwise, the application will not function as designed (King 1982). Poorly written software, for example, cannot fully utilize hardware computing resources, dropping overall performance of the system. Even well developed system might not be widely

used without sufficient demand for the application and institutional supports.

This characteristic often makes it difficult to estimate overall costs precisely. Cost estimations of public projects often turn out inaccurate and enormous "runaway costs" are frequently unveiled (King and Schrems 1978). Accordingly, it is not rare to observe IT applications that failed to be developed or implemented as scheduled, or that were not fully functional after being launched (Brown and Brudney 1998). Consequently, the interdependency of components should be carefully considered in decision-makings and costs need to be conservatively estimated.

3.6. Maintenance and upgrading

Maintenance and upgrading costs accrue over time since IT applications need to meet the changeable demands and to protect systems properly from potential attacks. In particular, phenomenal progress of information technologies increases technological advantages as well as risks at the same time. Accordingly, the software of IT applications should be responsive to citizens' diverse preferences and demands. The software also should evolve continuously so that it can cope with emerging attacks effectively. Of course, computer hardware needs to be upgraded as well, since it tends to be out of date in the economic sense as opposed to the physical sense.

These requirements hinder predicting maintenance and upgrading costs. Furthermore, determining social discount rates under the technological uncertainty is another barrier to the CBA of e-government projects.

3.7. Distributional and equity issues

Like typical public projects, IT applications involve a distributional issue, a disproportional distribution of costs and benefits. Who gets and who pays? Who gets more or pays more? IT projects are usually financed by taxation; the public pays the costs. However, primary beneficiaries are application users although the public may enjoy feeling improved public goods as a whole. There were 28,000 applications registered in the OPEN System during the first 13 months. Many applicants were for-profit organizations (e.g., construction and real estate companies) rather than individual citizens. In short, the time saving benefits were substantially concentrated on the applicants, while costs are widely distributed.

Equity and digital divide by computer literacy, gender, generation, and race are closely related to power payoffs. The networked is likely to benefit more from e-government applications than those not. Those who were not familiar with computing and the Web interface are less likely to use the applications in favor of old unautomatized systems. In order to minimize the gap and achieve universal services, governments have to improve equitable accessibility to the IT applications. For example, governments may provide many computer booths in public places and interlocking connection to wire/wireless telecommunications (e.g., automatic response system and mobile devices). IT applications need to be more intuitive and user-friendly especially for computer illiterates, and support a high level of software compatibility for existing operating systems and web browsers. In addition, it is necessary to keep old application handling process for a while.

Before beginning analyses, let me briefly introduce the Seoul OPEN System.

4. Seoul OPEN System

The Seoul Metropolitan Government (hereafter SMG), Korea, developed and implemented the Seoul OPEN (On-line Procedures Enhancement for Civil Applications) System that was initiated by the former Mayor, Goh Kun, in January, 1999 and opened to the public in April 15 of that year (SMG 2001; Holzer and Kim 2002). The OPEN System is a web-based IT application aimed at ensuring administrative transparency by disclosing administrative procedures through the Internet (World Wide Web).

Citizens are allowed to track their applications for permits and approvals by stages, and to access related information (e.g., regulations). They are able to monitor in real-time who is handling and reviewing their applications, whether there is any problem, and when applications are expected to be done. Applicants are able to know the reason an application is rejected, if any, and raise questions about or even objections to administrative decisions. In short, citizens can check the entire applications handling processes through the Internet whenever they want and wherever they are.

The Audit and Inspection Bureau was put in charge of overall development and implementation of the OPEN System. The Bureau selected target civil applications to be disclosed with primary focus on those 1) with a history of frequent corruption scandals, 2) whose handling processes are complicated enough to inconvenience citizens, and 3) whose opening to the public is likely to block solicitation of special favors. The Bureau also determined specific items to be entered by front-desk officials, and monitored system management as a whole. The Information System Planning Bureau and a contract IT company analyzed application handling processes (task analysis), designed the OPEN System, developed the program, and tested it for two and a half months. The Bureau also was in charge of personnel training and system maintenance in the implementation stage.

It is notable that the Mayor and the Audit and Inspection Bureau's strong initiative made it possible to overcome civil servants' unwillingness to cooperate and resistance against computerization. It was the Bureau who monitors input and process delays, verifies any omitted documents or mistakes in data input, and urges the

corresponding departments (or civil officials) in charge to correct the problems detected.

As a result, the OPEN System was reported to ensure administrative transparency by allowing citizens to check their applications from acceptance through the final result, and by monitoring any delay and mistake in data entry and handling processes. Citizens could save time and money without making unnecessary phone calls or face-to-face visits. By doing so, the OPEN System contributed to restoring public trust in the SMG. Consequently, the OPEN System was recognized as an advanced tool for anti-corruption at the ninth International Anti-Corruption Conference in 1999 and the United Nations' Seoul Anti-Corruption Symposium in 2001. These international recognition and successful achievements drove Korean local governments to adopt similar IT applications as the OPEN System.

5. CBA of old application handling process

The old civil application handling process begins with citizens' application submission. Applicants have to visit the city hall or autonomous district offices with required documents and user fees. Then, civil servants review the documents and decide whether or not to approve. They may need approvals of their supervisors to make final decisions. Then, officials inform applicants of the results.

What is the problem in this handling process? There is information asymmetry between civil servants and applicants. Citizens do not know exactly the process by which their applications are handled. Citizens have no formal way to check officials' decisions. Thus, civil servants have a strong incentive of taking advantage of this discretion. Rational civil servants may perceive that the expected cost of corruption is smaller than the benefit of corruption. The result is a high likelihood of the illegal exchange of public services and bribe under this incentive structure.

Table 1 summarizes CBA of the old application handling system using the Kaldor-Hicks tableau.[2] The baseline of CBA of the old system is user fee, no corruption (no tax avoidance), and no IT application. Applicants are willing to give bribe as long as the value of time saving efficiency is larger than the amount of bribe (E_b>B). Civil servants have incentives to take bribe unless the risk of being detected and punished is greater than the bribe. Unfortunately, the risk did not seem large enough under the old application handling system. In turn, general citizens suffer from social trust loss (G_b) due to corruption, and try to avoid tax (T), sometimes carrying out tax refusal movements. The SMG (civil servants) takes bribe at the expense of revenue loss (B-T).

Table 1. CBA of the old system (Before April 2000)

	Public	Applicant	Gov.	Net
Public Goods	$-G_b$			$-G_b$
Efficiency		E_b		E_b
Tax Avoidance	T		-T	-
Bribe		-B	B	-
Financing				
Development				
Maintenance				
Security				
Privacy				
Net	$T-G_b$	E_b-B	B-T	E_b-G_b

The net value of the old handling system ends up with E_b-G_b. If time saving efficiency from offering bribe is larger than the social trust loss, corruption will be productive in society. Otherwise, corruption should to be eradicated to achieve social justice and trust. However, a distributional issue remains unresolved, since the benefits of corruption are concentrated on bribers and corrupt officials, while the damage of corruption is widely dispersed among citizens.

6. Ex post CBA of the OPEN System

Now, the OPEN System is deployed to improve administrative transparency. How does the OPEN System change the application handling process? Applicants can check the handling process through the Internet. Accordingly, they do not need to visit the city hall or make phone calls. They can save travel and waiting time, transportation fee, and lunch cost, which must be substantial. These benefits are reflected in the applicants' efficiency gain (E_a) in Table 2.

Table 2. CBA of the OPEN System

	Public	Applicant	Gov.	Net
Public Goods	$0+G_p$			G_p
Efficiency		E_a		E_a
Tax Avoidance				
Bribe				
Financing	-F		F	-
Development			-D	-D
Maintenance			-M	-M
Security				
Privacy	-P			-P
Net	G_p-F-P	E_a	F-D-M	G_p+E_a-D-M-P

The OPEN System increased the risk that corruption is detected, discouraging civil servants from taking bribe. Not only applicants but ordinary citizens can check what civil servants in charge are doing. Any mistake and delay are automatically detected and directly

[2] The Kaldor-Hicks tableau is proposed by Kerry Krutilla (2004). Compared to the typical categorical accounting approach, this tableau approach enables researchers to analyze the distributional impacts on stakeholders in a public project.

reported to the Audit and Inspection Bureau. In this vein, the OPEN System seemed to be a strong control system as satirically described in the Charlie Chaplin's *Modern Times*. However, it does not necessarily mean that the OPEN System can guarantee "zero corruption." Instead, the OPEN System changed officials' incentive structures so that the cost of corruption increases. The result is the recovered public trust (baseline) and trust gain (G_p).

In turn, the public may suffer from the exposure of their private information (P) because of the trade-off between information openness and privacy protection. Anybody can know the exact location (full address), area of the site, size, and purpose of civil applications. So, if the social trust gain is greater than financing the IT application and privacy loss (G_p>F+P), the public will favor the OPEN System. Applicants enjoy substantial efficiency improvement (E_g) without losing anything. By contrast, civil servants have no chance of taking bribe.

The SMG has to pay for developing and maintaining the OPEN system (D+M). The costs should include capital (e.g., building and furniture), computer equipments (e.g., hardware and software), labor forces (for analysis, design, and programming), and training costs. But, little was said about system security and privacy protection.[3] The SMG spent $45,520 for program development and $292,000 for the UNIX system with a web server and a database management system Oracle installed (SMG 2001). [4] Instead, the SMG receives financing revenue (F), a transfer from the public to the SMG, and finally from the SMG to the contract IT company. Consequently, the net value of the OPEN System becomes (G_p+E_a)-(D+M+P). So the question is whether the public trust gain and applicants' efficiency gain is larger than the costs of the IT application and privacy loss.

Table 3. Net Difference between Table 2 and 1

Public	Applicant	Government	Net
G_p+G_b-T-F-P	E_a-E_b+B	F+T-D-M-B	G_p+G_b+E_a-E_b-D-M-P

Table 3 summarizes the net difference between Kaldor-Hicks tableaus 1 and 2. The public can get benefits of recovered social trust and trust gain at the expense of IT application financing, tax, and privacy. Note that G_b is a trust recovery benefit under the no corruption baseline. Applicants can get net efficiency gain (E_a-E_b) and bribe saving (B). So, they became the best beneficiaries of the OPEN System in a sense that they could get tremendous efficiency improvement without paying bribe. In contrast, the SMG, specifically civil servants, is a loser because information asymmetry has disappeared. The SMG had to spend revenues for the OPEN System (D+M), alleviating tax avoidance (T). Thus, the key question becomes whether social trust recovery and gain (G_p+G_b) plus net efficiency gain (E_a-E_b) are greater than costs for IT applications development, maintenance, and privacy loss (D+M+P).

However, this CBA does not touch upon distributional and equity issues, which should be properly dealt with in public projects. While most citizens do not use, even never know of, the OPEN System, only a few applicants can take great advantage of the OPEN System (E_a-E_b+B).[5] According to front-end civil servants, it was commercial institutions rather than ordinary citizens who took most benefits from the OPEN System. But, it was general citizens who financed the OPEN System. Is it reasonable that a government spend a large amount of revenue (tax) for an IT application to serve a few for-profit organizations?

On the other hand, equity and digital divides issues should be seriously taken into account in IT application projects. Younger generation and those who are empowered by computers and the Internet tend to take more advantages from the IT applications. The OPEN System did not support interlocking connection to wire/wireless telecommunications (e.g., cellular phones) for those not networked. Companies with superior information processing capacity are more likely get side-benefits than individual applicants from analyzing land uses and demands provided by the OPEN System. Like most IT applications, the OPEN System was optimized for the Microsoft Windows series and the Internet Explorer. [6] To minimize theses problems, IT applications should be highly accessible to the general public and be equipped with sophisticated authentication modules even for security and privacy protection.

7. SMG's CBA: politicians' view

Governments (bureaucrats) tend to emphasize benefits of a project, while underestimating, if not ignoring, the intangible costs like the opportunity costs of government-held assets. As spenders, they are often inclined to

[3] For the basic level of data security, IDs and passwords were provided to civil servants who were authorized to manipulate data in the OPEN System.

[4] According to the SMG, five civil servants and eight programmers had been working on the system development (from task analysis thought testing) for 10 weeks

[5] In the 2001 survey of the Seoul Institute for Transparency, the initial response rate of citizens was close to zero, implying that majority of citizens had not known the OPEN System at that time.

[6] Uses who use Netscape Navigator (Communicator), Mozilla, Opera, Safari, and Linux systems encountered less neat screens when accessing the OPEN System. It is largely because the hypertext markup language (HTML) pages of the OPEN System include some javascripts and cascading style sheets (CSS) that are not supported by the browsers.

embark upon some public projects without considering actual performances of projects, and internalizing the expenses that citizens have to bear (e.g., privacy loss). Thus, the CBA made from their perspective may fail to report correct cost and benefit information, often being used to justify the projects in hand.

The SMG have not conducted an official CBA of the OPEN System. But the SMG's view can be inferred from documents and announcements regarding the OPEN System. The SMG trumpeted achievements of the OPEN System (i.e., improved administrative transparency and citizens' efficiency), camouflaging opportunity costs and intangible costs. Thus, the costs and benefits information provided is not relevant from the standard CBA perspective.

Table 4. CBA from SMG's view

	Public	Applicant	Gov.	Net
Public Goods	G_p+G_b			G_p+G_b
Efficiency		E_a		E_a
Tax Avoidance				
Bribe				
Financing	-F		F	-
Development			-D'	-D'
Maintenance				
Security				
Privacy				
Net	G_p+G_b –F	E_a	F-D'	$G_p+G_b+E_a$ -D'

The SMG's CBA had several problems. First, it seemed to appraise benefits of improved public goods (i.e., public trust) using a corruption baseline (Table 4). The Anti-corruption Indices and citizens' satisfaction from surveys compared before and after the implementation of the OPEN System to highlight the difference. Thus, citizens' benefits are the sum of trust recovery and expended public trust (G_p+G_b). When subtracting table 1 from the 4, G_b is counted twice, inflating the benefits of public goods (see the Table 5).

The most serious problem in the SMG's CBA is that major intangible costs seemed to be ignored or underestimated. The opportunity costs of government-held assets (capital and labor) were excluded. Maintenance costs and system upgrading costs also seemed to be less considered. For instance, civil applications disclosed increased from 26 in 1999 to 41 in March 2000 and 54 in June, accruing additional costs. The costs of system security and privacy protection seemed to be ignored.[7] So the D' include such tangible costs as system development (hardware and software), implementation (deployment), and personnel training, which were paid to the contract IT company.

Table 5. Net Difference between Table 4 and 1

Public	Applicant	Government	Net
G_p+2G_b–T-F	E_a-E_b+B	F+T-D'-B	$G_p+2G_b+E_a-E_b$- D'

Finally, discount rates were ignored. Accordingly, the system development and earlier implementation stages of IT applications were largely focused. Costs and benefits accruing over time were ignored. The citizens' perception in the earlier stage tends to biased upward since the "feeling thermometer" is sensitive to the newness of IT applications. In contrast, depreciations of equipments and costs for system upgrading will sharply increase as related technologies advance and new potential threats to IT applications (i.e., hacking and viruses) become rampant.

As a result, the benefits were overestimated and costs were underestimated, inflating the net benefit and cost ratio. The public get combined social trust gain (G_p+2G_b) at the expense of financing and tax without privacy loss. The applicants can enjoy net efficiency improvement (E_g-E_b) and bribe saving. The SMG have to give up bribe and pay for system development and implementation with revenue increase (F). Thus, the net benefit of the OPEN System project became tremendous: ($G_g+2G_l+E_g-E_b$)–D'. How could governments hesitate to launch such a definitely beneficial IT application project? However, this CBA, although appealing to politicians, is just irrelevant from the standard CBA lens.

8. Discussion

The CBAs above suggest that at least five modifications be considered in the OPEN System in order to fix the problems mentioned in section 6 and 7. First, the OPEN System needs to have sophisticate authentication processes so that only authorized persons (i.e., applicants and the Audit and Inspection Bureau) can access full private information about ongoing civil applications. Others who are not directly related to the applications are allowed to see only limited information. However, this leveling policy (restricted access) will not substantially dilute the effect on public trust, since most citizens do not care others' applications. [8] This authentication functionality would be helpful to ensure not only privacy but also system security. It can also remedy the digital divide among those with large computing capacity and those without.

The second modification, although closely related to the first, is to enhance system security (S). Considering increasing reported damages from hacking and computer

[7] Two and a half months of system development implies that the OPEN System was not built on the cutting edge technology and that privacy and security issues were not completely reflected.

[8] What civil servants in charge are most concerning is the triplet monitoring of the Audit and Inspection Bureau and clients' (applicants) appeals to be reported to the Bureau.

viruses, IT applications must have strong system and data security modules (e.g., authentication and firewalls) to protect themselves from a variety of potential attacks. Otherwise, the applications have to take high risks that services are delayed or blocked; information is manipulated or stolen; or the applications are destroyed eventually.

Third, in order to improve accessibility and equity, on the other hand, the OPEN System needs to be interlocked with wire/wireless telecommunication devices so that citizens can access through telephone and cellular phone. In addition, existing operation systems and web browsers (e.g., Mozilla, Netscape, Opera, and Safari) should be fully supported. Of course, these modifications require additional costs, software efficiency loss, and security loss.

Fourth, the OPEN System should be vertically integrated and intelligent in order to improve internal efficiency (Layne and Lee 2000). The control-oriented OPEN System resulted in "painful" redundancy largely due to the parallel IT application implementation strategy. [9] Although reported inconvenience and complaints of front-end civil servants did not affect short-term governments' efficiency of labor reduction, these should have been taken care of appropriately. Government may be able to eliminate paperwork or let the OPEN System do that. An intelligent IT application based on process innovation will increase acceptability of the application, and employees' productivity, eventually administrative efficiency (E_g) by reducing labor and capital.

Table 6. CBA of the ideal OPEN System

	Public	Applicant	Gov.	Net
Public Goods	G_p			G_p
Efficiency		E_a	E_g	E_a+E_g
Tax Avoidance				
Bribe				
Add. User fee		-U	U	-
Financing	-F		F	-
Development			$-D-D_a$	$-D-D_a$
Maintenance			-M	-M
Security			-S	-S
Privacy				
Net	G_p-F	E_a-U	E_g+F-D-D_a-M-S	$G_a+E_a+E_g$ - D-D_a-M-S

Finally, the distributional issue should be seriously taken into account. One of useful policy tools is user fees levied on applicants. The additional user fee (U) is levied to the applicants who want to use the OPEN System to get great efficiency gain. This user fee is consistent with the "Benefits received principle," which says that taxes should be levied according to taxpayers' benefits from the public services. The additional user fee will make applicants worse off, while alleviating the distributional problem.

How will the upgraded OPEN System change the Kaldor-Hicks tableau? Four items newly appear in the Table 6: internal efficiency gain in governments (E_g), additional user fee from applicants (U), the additional cost of incorporating sophisticated features for vertical integration, privacy, and system security (D_a and S). Instead, privacy loss (P) disappeared in the tableau.

Now, the public is able to prevent private information leakage without paying for additional features. Applicants need to pay additional user fee for using the OPEN System. But applicants' substantial efficiency benefits enable them to remain better off even when additional user fee is imposed. The SMG will get revenue increase from the additional user fee, while paying additional cost for the sophisticate modules for internal efficiency, security, and privacy ($S+D_a$). The upgraded OPEN System in turn will eliminate inconvenience, security problem, privacy problem, and hopefully internal government efficiency (E_g). Thus, the governments will be better off as well.

Table 7. Net Difference between Table 6 and 1

Public	Applicant	Government	Net
G_p+G_b-T-F	E_a-E_b+B-U	E_g+T+F-D-D_a-M-S-B	$G_p+G_b+E_g+E_a-E_b$-D-D_a-M-S

The net value of the upgraded OPEN System becomes $(G_p+G_b)+(E_g+E_a-E_b)-(D+D_a+M+S)$. The OPEN System will be profitable if combined public trusts and efficiency gains are greater than the costs of system development, maintenance, security, and other enhanced features. The upgraded OPEN System will be able to alleviate the disproportional distribution and equity problems using additional user fee and sophisticated features. Thus, the upgraded OPEN System will improve social welfare more than the existing OPEN System.

9. Conclusion

The Seoul OPEN System allows citizens and civil servants to monitor application handling processes in real-time, thus improve information openness and administrative transparency. That is, the OPEN System removed information asymmetry between citizens and officials. Civil servants became less likely to take bribe unless there is huge rent, whereas applicants could enjoy great efficiency gain. Thus, the SMG often highlighted these great social benefits as compared with the tiny costs of system development.

[9] Civil servants had to register applications in the OPEN System and update application statuses within 10 working hours whenever they made decisions. Thus, they often had to stay late at the offices to enter data into the OPEN System and do the equivalent paperwork as well.

However, the CBA of the SMG version as in spenders' CBA inflated benefits of social trust and efficiency, and underestimated costs by ignoring major intangible costs. Unfortunately, this "constituency-support" view permeates in the CBA of e-government projects, being inclined to support as many government projects as possible. If privacy, system security, and equity issues are properly taken into account in addition to omitted significant costs, the benefit cost ratio of the OPEN System would be quite different. Consequently, the net benefits of the OPEN System, despite the success of the IT project at least in a political sense, seemed arguable from the standard CBA perspective.

From the CBAs so far, we can draw several policy analysis lessons. First, scholars and practitioners should be very careful not to be misled by the spenders' CBA. Second, all possible intangible costs and government-owned assets should be carefully taken into account in CBA. Third, maintenance and system security costs of IT applications should be seriously considered since they tend to be increasing and substantial. Fourth, privacy and equity issues should be addressed properly from the system design and development stages.

Final lesson is recognition of politics in IT application projects. E-government applications transform the quantity, format, and speed of information flows among citizens, civil servants, departments, governments, and private companies. In doing so, these applications affect ways of doing every day business as well as politics of human life. Thus, all stakeholders (especially politicians and top executives) must be greatly interested in power payoffs of e-government projects. Although rarely appearing in Kaldor-Hicks tableaus, this redistribution of relative power is real life and provides valuable clues to understand behavior of stakeholders in regard with IT applications adoption and implementation.

10. References

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