



Pergamon

Government Information Quarterly 20 (2003) 365–387

**Government  
Information  
Quarterly**

# E-government evaluation: A framework and case study

M. P. Gupta\*, Debashish Jana

*Indian Institute of Technology, Department of Management Studies, Delhi 110016, India*

---

## Abstract

The importance of measuring the performance of e-government cannot be overemphasized. In this paper, a flexible framework is suggested to choose an appropriate strategy to measure the tangible and intangible benefits of e-government. An Indian case study of NDMC (New Delhi Municipal Corporation) has been taken up for analysis and placement into the framework. The results obtained suggest that to have a proper evaluation of tangible and intangible benefits of e-government, the projects should be in a mature stage with proper information systems in place. All of the e-government projects in India are still in a nascent stage; hence, proper information flow for calculating 'return on e-government' considering tangible and intangible benefits cannot be fully ascertained. © 2003 Elsevier Inc. All rights reserved.

---

## 1. Introduction

Electronic government is no longer just an option but a necessity for countries aiming for better governance. People and policies play the primary role in making e-government a success. Technology plays a supportive, but important, role. However, it cannot work in isolation. Elements that are important to the effective administration of information include an empowered information technology leader in the form of a Chief Information Officer (CIO), a decision-making commission, the implementation of a statewide architecture, and the rollout of intergovernmental projects that include an efficient portal for citizens.

A proper policy framework is also of paramount importance in this context. Many governmental units across the world have embraced the digital revolution and placed a wide range of materials on the web, from publications to databases to actual government services online for the use of citizens.<sup>1</sup> In order to ensure success, however, it is important to assess

---

\* Corresponding author. Tel.: +91-11-26591173; Fax: +91-11-26862620.

E-mail address: mpgupta@dms.iitd.ernet.in (M.P. Gupta).

the performance of e-government and take necessary actions based on these assessments. Reengineering is evitable in such a situation, but organizations should analyze what kind of process reengineering they need.<sup>2</sup> Successful organizations develop a culture of measurement, educating employees on performance measures and uses as they manage their organizations through the processes which e-government delivers. These organizations are careful to ensure that performance is not merely a tracking exercise of items and numbers, but truly an assessment of the actual performance status and improvement in gains.

For the measurement of performance, the human aspect is vital. Organizations that have successfully implemented e-government have found that the specifics of mission delivery can be lost on employees if the organization does not establish measurable goals or measures too many things. Articulating a clear agenda, setting more expectations about performance and accountability inside government, and building a working team give better results in performance. Creating an open and transparent government is an ideal index of the effectiveness of gross government activity and progress. Governments in the US are using a variety of methods to find out what citizens want from e-government services.<sup>3</sup> These initiatives are in response to a survey, which found that the American public was frustrated by substandard performance in e-government. The performance of government agencies on the Internet is not keeping up with the public's demand for "faster, better and cheaper" services.<sup>4</sup> Furthermore, in the recent report by the Office of Management and Budget (OMB)<sup>5</sup> which evaluated e-government initiatives, 17 of the 26 executive departments and agencies were rated as unsatisfactory, and 9 only received a 'mixed-results' rating.

Taxpayers feel that they are not getting value for their money. They would like this value reflected in terms of cost savings and better performance. Different methods of performance measurement generate different kinds of results, with different levels of reliability. The requirements of citizens for e-government has increased many fold in recent years. Many citizens are demanding more and better services through the Net. In addition to general requirements, they would also like to vote on the Internet. Government organizations should make a performance evaluation and see whether they are capable of doing the task and delivering services as expected. At the normative level, concerns have already been expressed about the "digital divide" and whether e-government will exacerbate inequities among citizens. Addressing this concern and finding an amicable way out would also constitute a part of the effectiveness of government.

In a survey in the United States,<sup>6</sup> it was observed that among the state and federal chief information officers, 86% felt that e-government had improved service delivery, 83% believed that it had made government more efficient, and 63% claimed that it had reduced government costs. Twenty-nine percentage felt Congress or their state legislature had been very helpful in developing e-government, 43% believed legislative institutions had been somewhat helpful, 17% said they had been not very helpful, and 11% were undecided. Forty-nine percentage indicated they had relied on surveys, focus groups, or other kinds of market research in planning e-government activities and 71% said they had developed reports or strategic planning documents to help guide their efforts. In his recent study, West<sup>7</sup> found several interesting changes. After September 11, governments are taking security and privacy much more seriously than they did previously. Based on the survey, we can conclude that various departments gradually are taking steps to actually evaluate the effectiveness of

e-government. These steps are an acknowledgment of the concern for better performance. But efficient performance of the organization and accountability might be blocked by an administrative culture that may not be able to cope with the demands of a digital world.<sup>8</sup> In terms of how governments should respond, the authors suggest two sets of explanatory factors that will be determinants in measuring the performance of the organizations. First, one critical dimension is the development of partnerships and the emergence of new collaborative dialogues within government, between governments, and across sectors. Second, the other dimension is new skill sets in leadership, as new leaders will be required to both empower knowledge workers and defend experimental action.

There were major differences in e-government performance based on geographic location. In general, countries in North America score the highest, followed by those of Asia, Western Europe, Eastern Europe, Middle East, South America, Central America, the Islands of the Pacific Ocean, Russia and Central Asia, and Africa. However, every region showed gains compared to the previous year. According to a recently released report by the Center for Public Policy at Brown University,<sup>9</sup> Taiwan's e-government ranked first among 198 countries, followed by South Korea, Canada, the United States, Chile, and Australia. India ranked 59<sup>th</sup> in the order of e-government ranking. The Government of India (GoI) had declared 2001 as the 'Year of e-government.' The purported aim was to promote and enhance the use of IT in governance in accordance with the measures suggested by the Task Force set up by the Ministry of Information Technology (MIT) in 1998. But a look at the actual implementation shows that almost 40% of MIT's targets are yet to be achieved and most of them, directly or indirectly, relate to e-government.<sup>10</sup> According to Gartner Research, only 10% of the government bodies around the globe will be able to move toward e-government by 2005. India is lagging behind due to poor infrastructure and the slow response to the emerging cyber-culture. The transition from governance to e-government takes place in four phases, beginning with a "presence" phase, followed by "interaction," "transaction" and a final "transformation" phase. India is still in the earliest phases of its transition.<sup>11</sup>

Flexible demographics and competition between the different regions in the country could eventually propel e-government to prominence in India. However, the constraints are bulky enough to stymie any immediate advances. It is not surprising, therefore, that a proper evaluative framework for e-government projects is not in place. The few exceptions include the computerized registration of land/property in the state of Andhra Pradesh, and computerized interstate check post in the state of Gujarat, where cost-benefit analyses of the projects have been done to calculate the incremental revenue and the payback period of investments.<sup>12</sup>

## **2. Framework for evaluation**

A range in the classification of methodologies in terms of degree of hardness or softness may be based on the clarity and nature of the influential variables of a problem situation. Clearly defined problems are structured problems, while poorly articulated or unclear problem situations are categorized as ill structured problems. Identifying the methods that match the underlying characteristics of a problem situation represents an issue that needs to be considered especially in a complex situation. Operations Research (OR), Management

Science (MS) and Applied Systems disciplines have been traditionally offering quantitatively based, hard techniques. However, during the 1970's and 1980's, a variety of qualitative, soft and critical methods were developed. According to Mingers<sup>13</sup> the typical assumptions made by a hard OR/MS method are:

- that there is a single decision maker (or at least a consensual group) with a clear objective—if there are multiple objectives these are usually reduced to a single metric;
- that the nature of the problem is agreed upon, even though a good solution may be difficult to find;
- that the most important factors can be quantified and reliable data collected;
- that a model, often mathematical or computer-based, can be used to generate solutions, and that this does not need to be transparent to the client(s);
- that the role of the OR person is one of expert analyst; and
- that future uncertainties can be modeled using probability theory.

On the other hand, soft methods can be characterized by generally not making these assumptions. Typically, there might be several decision makers or stakeholders involved, with different opinions and possibly conflicting objectives and definitions of the problematic nature of the situation; there may be difficulties in quantification of many important factors; transparency and accessibility of the model will be very important, thus often ruling out mathematical models; the OR person's role will often be one of facilitator with a group of participants; and uncertainties will not simply be reduced to probabilities.

One important implication of this distinction is that these different types of methods require quite different skills and orientations in their practitioners. Hard methods would demand a good analytical mind with mathematical and computing skills, while soft methods require people skills and the ability to facilitate often stressful and contentious workshops. According to Wolstenholme,<sup>14</sup> no map or model is ever a complete analysis and there is always still a need for further speculation beyond the insights reached by their use. Furthermore, in applying any problem solving method there is a need to create a balance between the need to remain sufficiently quantitative to be applicable and rigorous and sufficiently flexible to be relevant in terms of both audience and method. This allows the possibility of combining methods or techniques together in a particular intervention, a practice known as multimethodology. Thus, after a period of concern about the choice of methodology, we are now moving toward a pluralistic approach of combining together several methods within an intervention/multimethodology.<sup>15</sup>

E-government projects may be characterized by hybrid systems. However, a large part of e-government projects are soft systems, which are often prone to perceptual inconsistencies among designers and users. This often leads to elegant system failure. This also has to match the ongoing changing pattern of relations or interactions between government organizations, businesses, and citizens. Here, a combination of hard and soft systems methods would be suitable in addressing problems of evaluating e-government projects. In general, any approach to evaluation of e-government needs to have a few important characteristics including the ability for understanding and modeling complex problems, the ability to incorporate multiple views of the problem, and the ability to learn from mistakes. The literature of e-government offers few approaches, which have been found useful in selective evaluation.

These are arranged in a broad category of methods for ease of understanding and methodological choice for determining information and servicing value attributable to the several aspects of e-government benefits. The sociological evaluation of the benefits of these projects has also been emphasized. We have selected a few of the methods that are well known and easy to apply. However the framework is open to include other methods (not mentioned here) in its range depending upon finding a satisfactory application. A broad categorization is as follows:

- **Hard measures:** Cost benefit analysis; Benchmarks in e-government
- **Soft measures:** Scoring method; Stages of e-government; Sociological angle
- **Hierarchy of measures:** 6 Levels

### 2.1. *Hard measures*

Here information is viewed as valuable when a message changes a decision-maker's expectations about the events in a manner that facilitates decisions and improves the expected payoffs. The information is being weighed against the backdrop of cost benefit analysis. It seeks to find answers to how much money is being spent to acquire the information and how much benefit in monetary terms is being obtained. This issue has been dealt with most thoroughly in information economics, which finds its base in statistical sampling concepts, Bayesian statistics, and statistical decision theory based research papers that appear mainly in accounting journals.

The main drawback of this approach lies in their operationalization. As information and related services in e-government are intangible organizational resources, it is sometimes impossible to quantify the cost and value associated with obtaining and using it. Some benefits related to e-government such as improvement in communication with the users, better appreciation of the role of the information system (IS) within the organization, and better integration with business planning are difficult to assess using objective measures. Since the utility of information and related services is not direct, it has value only in so far as 'better' decision results, leading to an increase in resources or a decrease in cost.

Most importantly, improved organizational performance, such as increase in transactions or improved return on investment, is produced by a multitude of activities that take place concurrently. Thus, it is very difficult to measure or split the proportion of outcome as value contributed by information systems of e-government. Information can also have psychological value if the user does not necessarily make better decisions but has more confidence in the correctness of his decision. Though the role of information at the strategic level is very crucial, measurement of its worth in monetary terms is an impractical proposition. The trend henceforth would be to investigate the diffusion of IT solutions in terms of its impact on organizational effectiveness in performing and servicing the user better.

The key measurement criteria for measuring tangible benefits under hard measures are:

#### 2.1.1. *Cost benefit analysis*

Prudent investment and deriving benefit in monetary terms for any organization is a very critical decision.<sup>16</sup> Public finance has considered important differences between goods

provided by government and goods owned by individuals: governmentally provided goods are often public goods, each person may be able to consume them at a price less than marginal social cost, and the level of provision is determined by collective decisions rather than by markets.<sup>17</sup> There have been attempts to examine the information technology (IT) capital investments (including software) and capital stock to check how these investments are justifiable by calculating the marginal benefits and costs of IT related investments.<sup>18</sup> There is strong evidence that IT investment is not meant to cut costs but to achieve better customer service and quality.<sup>19</sup>

IT infrastructure in e-government is a long-term investment decision, involving a current outlay followed by a series of benefits over the life of the project. The evaluation of cost benefit can be in a traditional or time adjusted/discounted basis method. The average rate of return (ARR) as the conventional method of appraisal is unsatisfactory to the extent that it is based on accounting profits and ignores the time value of money. The payback method, which shows the recovery period of the original outlays, is superior to ARR method in that it is calculated using cash flows. Nevertheless, it also ignores the time value of money and disregards the total benefits associated with the projects. Still, it is useful as a measure of the liquidity of investments. The discounted cash flow methods in the net present value (NPV) approach satisfies all the attributes of a good measure of appraisal in e-government projects as it considers the total benefits as well as the timings of the benefits. The NPV method has the merit of consistency in assumptions relating to reinvestment of funds released by the projects.

In this method, one important aspect is to determine the cost of capital by which the future incremental cash flows are to be discounted. The cost of capital means the weighted average cost of capital of all long-term sources of finance. The cost of capital can be explicit or implicit. The explicit cost of capital is associated with the raising of funds. When the funds are internally used, the cost is known as implicit cost in terms of the opportunity cost of the foregone alternatives. Investments in infrastructure, training, and other costs are noted. The extra business transactions and the savings in man-hours that result from the streamlining of operations are calculated and translated into incremental revenue. Based on incremental revenue, the payback period is calculated by dividing investments by incremental revenue generation each year. The breakeven period is calculated by the NPV method by discounting the amount earned as incremental revenue at rate of cost of capital. There may be four types of specific costs, namely cost of debt, cost of preference shares (if any), cost of equity capital, and cost of retained earnings. The measurement of the overall cost of capital involves the choice of appropriate weights to each of these elements.

In the domain of e-government in India, for the government organizations (public sector enterprises) that raise debt and equity capital from the market, computation is easy. However, there are several governmental organizations that mostly depend on central or state government aid to run their business operations without any implicit or explicit obligation to pay back the aided amount. The computation of the cost of capital for these organizations by the traditional means given above might prove irrelevant or inadequate. In organizations that generate revenue streams adequately to fund their own investments, the cost of capital should be that of retained earnings only.

In the e-government scenario, capital investment is made mainly to improve the quality of

service unlike manufacturing organizations where the investment is mainly on machines in order to produce goods. In that case, the payback period or break-even period can be computed easily. But for any service organization where productivity of employees or better service of the organization is concerned, the traditional cost benefit analysis might not give a true picture. The biggest drawback about this system is that the true monetary value of benefits such as increased quality, faster service, flexibility, better citizen service, or improved working conditions for employees cannot be ascertained.

### 2.1.2. Benchmarks in E-government projects

Evaluation of e-government efforts is sought by management to provide strategic guidance for the government organizations. A brief review of the same is reported by Kaylor, Deshazo, and Eck<sup>20</sup> citing some interesting research.<sup>21</sup> These efforts share a general concern with identifying objective measures by which we might assess the quality of e-government. Most of these studies have often focused on content analysis or measures of usage. Benchmarking is a superior option as it provides a method of evaluating performance against best practice and provides strategic guidance. Kaylor, Deshazo, and Eck<sup>22</sup> suggested a rubric for benchmarking implementation among cities nationwide using a broad range of functional dimensions and assigning municipalities “e-scores.”

One form of benchmarking is through metric benchmarking,<sup>23</sup> which provides numeric measures of performance, such as:

- IT expenses as percentage of total revenues
- Percent of downtime (when computer is not available)
- CPU usage (as percentage of total capacity)
- Percent of IS projects completed on time and within budget as part of e-government projects

In the Indian context, this might not be possible, as most of the projects are in a rudimentary stage and only a few are operational. Therefore, comparing similar organizations in India or abroad would be a challenge since this form of information might not be available or obtaining information might be difficult. A practical approach would be to experiment with the idea of ‘Best Practices Benchmark’ as suggested by Kaylor, Deshazo, and Eck.<sup>24</sup> Here emphasis is on assessing performance rather than numeric measures of performance. It mainly deals with IT infrastructure and compares the best practices in servicing in similar types of organizations and work areas. Grading is done from the perspective of implementation rather than perspective of “end-users.” Select activities of the municipalities are listed (Table 1) and are assigned a value on a four point scale (called an e-score) as given below:

- Information about a given topic exists at the website (1)
- Link to relevant contact (a phone number or email address) exists at the website (2)
- Downloadable forms available online on a given topic (3)
- Transaction or other interaction can take place completely online (4)

Various municipalities can be graded based on these e-scores.

Table 1  
Functions and Services of Municipalities

S.No.	Payments	Permits	Services	Licenses
1.	Utilities	Building	Complaints	Bike
2.	Taxes	Parking	Payment details	Dog
3.	Fines	Street vendor	Information request	Taxi
4.	Permits	Sidewalk Dining		Business
5.	Registration			

## 2.2. *Soft measures*

Researchers have realized that though the normative approaches are theoretically elegant they nonetheless present formidable operational difficulties in real-life situations. Furthermore, the significance of qualitative benefits is often ignored when an evaluation of these systems is made from an economic point of view. This may result in the neglect or rejection of many potential new systems offering high returns from intangible benefits. Benefits such as improved decision making, customer or citizen satisfaction, and employee productivity contribute significantly to higher performance. In view of this, an effort at finding a compromise solution to evaluate e-government is the need of the hour. Soft approaches employ multidimensional attribute measures of information value, which is relevant in the context of e-government. Simultaneous consideration of multiple attributes facilitates the understanding of the extent and depth of the problem.

### 2.2.1. *Scoring method*

Scoring methodologies are used in many evaluation situations, focusing on key organizational objectives. To use the scoring methodology,<sup>25</sup> the analyst first identifies all the key performance issues and assigns a weight to each of them, then the weighted average of all the attributes is calculated. The item with the highest score is judged the best service provider in comparison to similar organizations.

This approach can incorporate both tangible and intangible benefits. If there is a strong connection between a benefit accrued due to investment in IT infrastructure of e-government, it will influence the final score even if it does not have a monetary value. Thus the scoring model helps solve the problem of assessing intangible benefits by linking the evaluation of these benefits to the factors that are most important to organizational performance. The approach can also take risk into account, by using negative weights for factors that reduce the profitability, operability, and user satisfaction.

### 2.2.2. *Stages of e-government*

A literature survey of the area demonstrates that the experience of e-government initiatives has been chaotic and unmanageable. The problems present a number of challenges for public administrators. To help public administrators take an organizational view of transforming a traditional administrative organization to e-government, Layne and Lee<sup>26</sup> describe different stages of the development of e-government with particular reference to the United



States of America. The four stages of development outline the structural transformations of governments as they progress toward electronically-enabled government and how the Internet-based government models become amalgamated with traditional public administration implying fundamental changes in the form of government. The underlying theory of this growth model will be applicable to other governments as well.

Based on the technical, organizational, and managerial feasibilities of several examples, e-government is found to be an evolutionary phenomenon, and therefore e-government initiatives should be accordingly derived and implemented. In this regard, the four stages of a growth model for e-government are described as: (I) cataloguing, (II) transaction, (III) vertical integration, and (IV) horizontal integration. These four stages are explained below in terms of the complexity and different levels of integration involved (the NDMC case is shown in Fig. 2).

*Stage I: Cataloguing* (Online Presence, Catalogue Presentation, Downloadable Forms): In this stage, governments create a 'state website.' At this stage, governments do not have much Internet expertise, and they prefer to minimize the risk by doing a small project. Parts of the government's nontransactional information are put on the site. Usually at first the index site is organized on the basis of functions or departments as opposed to service access points. Consequently, if the citizen is unsure of which department he or she is searching, a search for the necessary agency will be required before being able to obtain the information about the process.

*Stage II: Transaction* (Services and forms are online, Working database supporting online transactions): This stage empowers citizens to deal with their governments on-line anytime, saving hours of paperwork, the inconvenience of traveling to a government office and time spent waiting in line. Registering vehicles or filing state taxes on-line is only the beginning of such transaction-based services. Consequently, instead of simply having the availability of downloading a form, but then having to take that form to a state facility, the form can be completed interactively on-line.

*Stage III: Vertical Integration* (Local systems linked to higher level systems, Within similar functionality): Information is made through citizen's local portal. The citizen-user should still be able to access the service at the state or center level from the same entry in the local portal, because the local systems are connected to upper level systems, directly or indirectly.

*Stage IV: Horizontal Integration* (Systems integrated across different functions, Real one stop shopping for citizens): The horizontal integration of government services across different functions of government will be driven by visions of efficiency and effectiveness in using information technology, but pulled by citizens' demands on an 'inside-out' transformation of government functions to more service oriented ones. Here e-government offers the best hope for improved efficiencies through administrative reform because of both its vertical and horizontal integration. Such integration will facilitate "one stop shopping" for the citizen. Each organization may have to give up some power to move to this stage.

### 2.2.3. Sociological angle

Whenever new technologies come into the picture, especially in governmental organizations there is fear among the employees about job loss through the Voluntary Retirement Scheme (VRS) in India or a similar program elsewhere, although direct retrenchment is still

only a distant possibility in the public sector in countries like India. This may be true in many other countries, as well. Increased transparency due to more automation might not be acceptable to a certain section of the employees who will always resent these initiatives. Moreover, we must not underestimate the apathy involved in the assimilation of new technologies.

An opinion survey would be useful to gauge the responses of employees' adaptability and responsiveness in the new systems. The areas that could be looked into include the bureaucratic hurdles faced in moving toward an alternative delivery arrangement, the level of transparency and accountability of the employees in new collaborative arrangements, and the likely road ahead about the future of e-government (a resistance to change or regressive deployment, status quo or incremental change, and radical adaptation for a digital world).

Therefore, the most important responsibility lies with the top management. Accordingly, the HR department can be sensitized (as e-government is foremost a top down approach) to make employees knowledgeable about the benefits of e-government, as well as giving them the necessary training.

### 2.3. *Hierarchy of measure*

A good method is required to determine the criteria for evaluation, to develop the means to measure the variables for which criteria are established, and to test these with the help of the relevant data. We can consider three types of valuation. The *first* would address the value of an organization-wide infrastructure. Factors such as a communication network, a standardized data management approach and an IS architecture's impact and benefit to the entire organization must be evaluated in this context. This is one of the more difficult things to evaluate because benefits stem not from a network but from the applications it supports. The *second* would consider the applications implemented to support specific or multiple functions within an organization. IT does not directly produce value. The value is in its impact upon the organization. The *third* area of concentrated IT support is at the level of the individual user. It can be very diverse in terms of the amount of use and the ability of the user to take advantage of the type and amount of available computer-based support. This diversity makes assessing the value of IT use very complex. No single measurement tells the complete story. A combination of measuring tools is desirable, among them counting transactions, industrial engineering kind of evaluations and interviewing those who are actually involved, including both direct and indirect personnel and managers. These measurements may not be precise from an accounting standpoint, although they represent information that can be used to satisfy senior officers. Feltham defined numerous characteristics of information to which we may attach quantitative as well qualitative measures.<sup>27</sup> This has been developed into a flexible framework for choosing an appropriate strategy in a continuum of quantitative to qualitative approaches for determining information value attributable to the several aspects of "Return on Information," which views the role of information strategically.<sup>28</sup> This refers to developing a functional view of the organization, identifying specific functions at various levels of management to analyze how IS/IT is able to improve that function, and developing Measurement of Performance for that function. A similar approach can be devised for measuring the "Return on e-government."

Table 2  
Measurement Hierarchy attributable to “Return on e-government”

Hierarchy in the performance		Change that is measured
Level 1	Return on investment	Rupees/Dollars
Level 2	Total costs and revenues	Rupees/Dollars
Level 3	Improvement in quality of planning and control	Time required to work out plans, Cost of planning, Managerial time required for control, Degree of automation, Forewarning, Cost of control
Level 4	Quality of decisions	Frequency of failures/reversal of decisions, Number of alternatives examined, Time required for decisions, Number of decisions, Availability of decision support systems, Cost of decisions.
Level 5	Value of information	Usefulness (in terms of validity, accuracy, clarity, frequency, sufficiency, timeliness, reliability, relevancy, message content and cost).
Level 6	System characteristics	Number of people required, equipment and facilities, response time, frequency of breakdowns, inputs, outputs, number of forms, number of operations, number of storages, sizes and quality of data bank, size and quality of model bank, flexibility, simplicity, degree of automation, scope of business components that are related by the MIS, user satisfaction, error rates, persistent problem areas, ease of maintenance and modification, unplanned-for impact on company performance, savings, cost, etc.

It is clear that we can generate a significant return on information, the value of which would be more than the investment by developing a strategic view of information. The telecommunications industry is a good example of this situation. It uses many imaginative schemes, such as calling cards, credit card calling, and fixed rate billing, to reduce the costs of the billing process. This is also the case with the computer hardware industry, which has realized the need for promoting energy saving devices. The green PC movement led to the offshoot of the idea of “sleep mode” for monitors and disk drives, saving hundreds of megawatts of power.

It is tempting to use a more general approach in determining the value of e-government. A flexible framework or hierarchy of measure, which offers a continuum of choices, would help. The framework “Return on e-government” refers to developing a functional view of the government organization, identifying specific functions at various levels of administration to analyze how IT is able to improve those functions and develop a Measurement of Performance for them. After measuring the tangible and intangible benefits pertinent to e-government, an evaluation framework may be evolved to fit the evaluation criteria in a more generic approach in determining the value of an Information System with regards to e-government. This can be fit into hierarchy measures as “Return on e-government,” attributable to IT applications for governance, both tangible and intangible as shown in Table 2. Using the framework suggested in Table 2, an e-government function must be examined according to

the level of measure that is applicable in a specific context. The first preference is obviously for the measure of net return in dollar terms. The next best option is to explore identifying specific costs that are increased due to the installation of the new system. This may provide a conservative evaluation of the subdivision of benefits. If we fail to measure changes in costs and revenues, an attempt should be made to measure the improvements in the performance of administrative and managerial functions, that is, improvement in the quality of planning and control. Subsequent to that, we may consider measuring the quality of decisions that contribute to planning and control if the above schemes fail. As we go up the management hierarchy, development of measurement of performance becomes difficult as it deals with the most complex functions, particularly at the strategic level where much information is qualitative and probabilistic.

Eventually, what comes to the fore is not how to quantify the contribution of e-government, but to consider how useful the information and services are in the context of its use. Information and services, which are useful, have value. Usefulness can be defined in terms of the performance of its attributes such as validity, accuracy, clarity, reliability, timeliness, relevancy, sufficiency, message content, freedom from bias, comparability, scope of multiple users, database and cost. These contribute to the value of information and services. A conglomeration of these attributes can be represented by a composite quality index, identified as the “e-government performance index.”

### **3. A case study of New Delhi municipal corporation**

The evaluation methods described in the previous sections are used here in the context of e-government initiatives of the New Delhi Municipal Corporation (NDMC). CMC Limited (now a part of the Tata Group) has been engaged in implementing these projects. Data have been collected from the published reports, news items, as well as through personal interviews with the officials of NDMC and CMC. A brief history of NDMC is given below. This is followed by a description of its departments, functional areas, and financial strengths. The factors, which necessitated the development and implementation of e-government projects by NDMC, are also described below.

#### *3.1. A brief history of NDMC*

The transfer of the seat of the Government of India from Calcutta to Delhi was announced on 12 December 1911. After detailed examination, survey, and debate, Raisina Hill was selected as the most appropriate site for the Viceregal Palace and the areas East, North, and South of it were chosen for the new capital. Edwin Lutyens and his compatriot Herbert Baker built the new capital of India that would be known as New Delhi. The “Raisina Municipal Committee” was established in 1916 to cater to the municipal needs of the labor engaged in the construction of the new capital. In 1925, the then Chief Commissioner upgraded it to the level of a “Second Class” municipality to be governed under the Punjab Municipal Act, 1911. At this time, it was known as the “Imperial Delhi Municipal Committee.” It was named “New Delhi Municipal Committee” and in 1932, it became a “First Class” municipality. In May 1994, the NDMC Act, 1994, replaced

the Punjab Municipal Act, 1911, and the committee was renamed as the “New Delhi Municipal Council.” The Act was passed by Parliament. The area of NDMC includes the seat of the central government, the Rashtrapati Bhawan, the Prime Minister’s office and residence, central government offices, foreign missions, residences of ministers, members of parliament, diplomats, and central government employees.<sup>29</sup>

### 3.2. Main functions

In addition to providing basic civic amenities to its residents, the Municipal Council also provides various social, cultural, educational, and medical facilities, especially to the government/municipal employees and other sections of society. Actually, the NDMC is a municipality with a difference; the Act enjoins upon it the role of the minigovernment, with all facets of city management except that of policing and transportation. It is perhaps the only municipality in the country that supplies electricity and water, and its discretionary functions encompass the promotion of sports, art, music, and culture, the maintenance of libraries, and care for the elderly. It takes care of housing problems, social facilities like *Barat Ghars* (Marriage Houses), and community centers.

The chairman is head of the organization, which is functional by design. It has departments such as architecture, commercial, civil engineering, education, electricity, enforcement, estates, finance, health, horticulture, information technology, public relations, and welfare. Each department has a director as its head. There are chief engineers, senior engineers, and engineers working under the director. Below them is clerical level staff. The office automation usage starts from the clerical level.

### 3.3. Budgetary status

In the budget estimates for the year 1999-2000, an expenditure of Rs. 661.19 crores [1 Crore = 10 million] and receipts of Rs. 617.44 crores were anticipated and a deficit of Rs. 43.75 crores was initially projected [1 US Dollar = 50 Rupees or Rs (approximate current value)]. Projected receipts in the annual budget included plan assistance of Rs. 21.10 crores (Rs. 7.5 crores loan and Rs. 13.6 crores grant-in-aid). The plan outlay of NDMC had been curtailed by the Government of Delhi to Rs. 19.25 crores. However, NDMC has been able to sustain ongoing works on important infrastructural schemes by providing funds from its own resources. The year 1999-2000 closed with a surplus of Rs. 2.73 crores in the revised estimates, despite increased expenditure on the maintenance of essential services and establishment costs and the diversion of nonplan funds towards plan schemes. The receipts have gone up to Rs 884 crore in the year 2002-03 as against a target of Rs 886 crore and the expenditure incurred on both plan and nonplan sectors amounted to Rs. 614.74 crores. Therefore, unlike other municipalities, NDMC is quite cash rich.

### 3.4. E-government project implementation

Going by the traditional brick and mortar model, NDMC’s revenue collection was less than adequate due to system snags and bureaucratic delays. Service quality and transparency

in operation was also poor. The Government of India, now, has a concrete proposal for various governmental organizations to become web enabled and provide higher quality of service. Worldwide, various municipalities are taking steps to become web-enabled, and many municipalities have succeeded in this task. Hence, to respond to the growing need of the external environment and to streamline their business operations to generate more revenue and provide quality service, NDMC decided to implement the e-government project. Since the municipality is cash rich, it decided to implement the project with in-house funding while CMC was hired to implement the project.

### 3.5. Present status

The revamping of the IT infrastructure has now taken place with the inclusion of several citizen interfaces. The project started in April 2001, and will be fully functional within the year 2003. As part of the computerization drive, the civic agency was trying to create a payment gateway on the Internet. As per latest news that appeared in the Times of India,<sup>30</sup> it is in the process of finalizing a deal with the State Bank of India for creating a gateway that will enable residents to make payments on the Internet using credit or debit cards. Information about electric and water bills on the website has been launched. All officials are being provided computer training.

### 3.6. Key system description

A questionnaire survey was conducted to gauge the tangible and intangible benefits being derived by infrastructure investments and training in e-government. The key system characteristics are given below.

- i) Number of people having access to computers: 250
- ii) A brief description of the equipment and facilities provided

Computer configuration –*compaq p4 systems*

Networking infrastructure –*2 compaq alpha (risc) servers, cisco switches, routers*

Internet and intranet facility and systems configuration –*interactive voice response system*

Email and web facility, type–*web interface to ndmc services*

Standard software packages–*win2000, oracle, d2k*

Inhouse software–*voice (provided by cmc)*

Purpose –*Computerization of NDMC departments (VOICE software delivers municipal services such as building approvals and birth and death certificates. It also handles the collection of property, water and sewerage taxes.)*

Frequency of breakdown of the system –*negligible*

Response type in such typical breakdown–*backup server provided with clustering solution*

Data storage system of the department–*storage solution with cluster is provided*

- iii) Does the organization have a dedicated website? *http://www.ndmc.gov.in*

- iv) Does the website have an external user interface? *Yes, in addition, in various places in New Delhi touch screen kiosks have been provided for making readily available information to end users.*
- v) What are the various operations being performed by the organization? *Catering to various departments operations as mentioned before.*
- vi) Is there built-in flexibility in the system to cater for diverse needs? *Yes*
- vii) Is the system and operation simple to use for the operators? *Yes*
- viii) How much degree of operation is there in the system? *Almost full for the implemented ones, the rest are under implementation.*
- ix) Is any full-fledged MIS in operation? *MIS is being developed. Some part is in operation.*
- x) What are the businesses components related by MIS? *Birth and death statistics, DCB (Demand/Collection/Billing) statements for water, electricity and property tax, grievance status, building approval status and so forth*
- xi) What are the persistent problem areas? *Data migration to new system.*
- xii) How easy is it to maintain and modify the system? *System based on parameterization open for customization and further addition.*

### 3.7. Evaluation and analysis

#### 3.7.1. Cost benefit analysis

The total cost for implementing the NDMC project, including training, was approximately 20 million Rs. This excludes hardware costs. So far, few modules have been implemented and total incremental revenue for the streamlining processes and timesaving has not been estimated yet. Hence, cost benefit analysis at this point in time cannot be ascertained. As all the investments made by NDMC in this project are through inhouse funding due to the availability of surplus funds from revenue, the incremental revenue should take into account the implicit cost of capital for the project with opportunity cost.

#### 3.7.2. Benchmark for NDMC

E-score for NDMC is shown in Table 3. A comparison with the results of Kaylor, Deshazo, and Eck<sup>31</sup> for US cities is shown in Fig. 1.

It is worth noting that in such a short span of time NDMC has scored better than the municipalities of Detroit and Cleveland. However, the population of the NDMC area far exceeds that of Detroit where a small-scale e-government is in operation with far fewer complexities for civic amenities.

But if we compare the NDMC data with similar big cities at least in terms of population and complexities like New York and Seattle, NDMC's score is abysmally low (15) compared to them (86-89). This means that to be at par with these leading cities, NDMC has to perform exceptionally well. It is expected that after full implementation of the e-government project, when many transactions can be done online, NDMC's score will rise substantially. A more prudent approach to benchmarking would have been comparing NDMC with other municipalities of India in order to generate a benchmark among Indian municipalities.

Table 3  
Score for NDMC

Payments			
	Utilities	1	Only information available
	Taxes	3	Downloadable forms available
	Fines	1	Only relevant information available
Registration		0	Nothing is available so far
Permits		0	Nothing is available so far
Customer Service	Action requests (Complaints)	3	Downloadable forms available
	Code enforcement	1	Only information available
Communication about Emergency information		0	Nothing is available so far
Licenses			
	Business	1	
Images		0	Nothing is available so far
Audio/Video		0	Nothing is available so far
Documents			
	Budget report	1	Only information available
Applications			
	Bidder/tender applications	3	Downloadable forms available
E-procurement		0	Nothing is available so far
Miscellaneous			
	Property Assessment History Lookup	1	Only information available
	Total	15	

3.7.3. Scoring method

Based on IT infrastructure of NDMC, the weightage obtained from the questionnaire survey has been incorporated to obtain the overall score as tabulated in Table 4. This figure

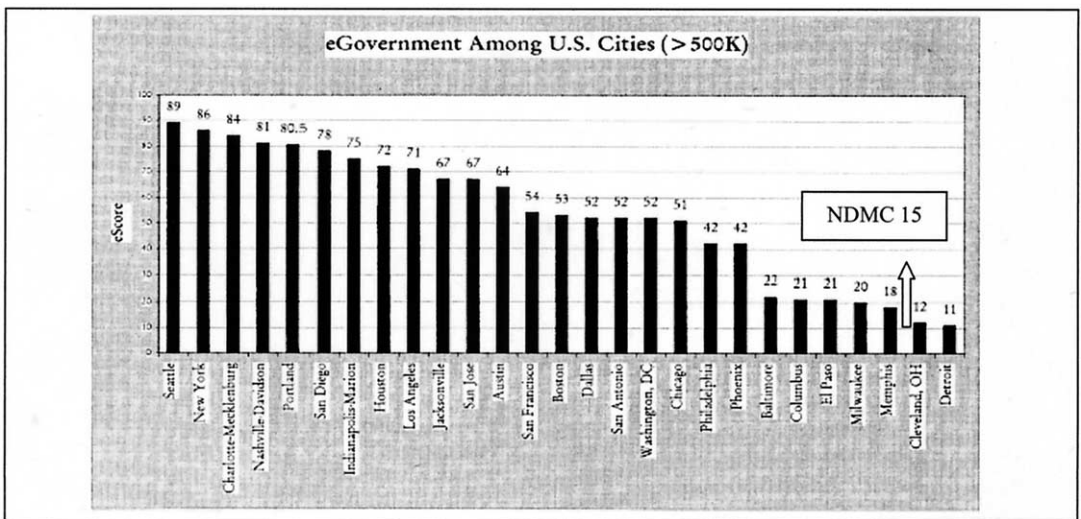


Fig. 1. Adapted from the Gauging e-government: A report on implementing services among American cities by Kaylor, Deshazo, & Eck.<sup>20</sup>



Table 4  
Results of scoring method

Criteria	Weight	Multiplying factor	Multiplying weight
Ease of use	1.5	8	12.0
Reliability	1.5	7	10.5
Data query and display	1.0	8	8.0
Storage and retrieval	1.0	7	7.0
Documentation	0.5	8	4.0
Expandability	0.5	6	3.0
Reporting	1.0	7	7.0
Speed	1.5	9	13.5
Support	1.0	8	8.0
Pricing	1.5	7	10.5
Total	11		83.5
Overall score			83.5/11 = 7.59

can be compared with other municipalities, which are dealing with almost identical infrastructure and service through e-government. A comparison could not be presented here as we do not have data about other cities.

#### 3.7.4. Stages of e-government

As per the stage model of e-government, NDMC has achieved Stage I of the model—Cataloguing (See Fig. 2). It has fairly exhaustive information about various facets of activities of NDMC including downloadable forms of various departments, such as taxes and utilities. However, online transactions have not been included so far, though they are expected to be ready by the end of 2003. As soon as on-line transactions are permitted, NDMC will move up to Stage II of this model.

#### 3.7.5. Sociological angle

Based on the questionnaire survey the following observations can be made about NDMC, its employees, and their attitude towards e-government.

- i) Partnership: With the spread of e-government in NDMC, it has been observed that there is a subtle shift from traditional bureaucratic structure to alternate delivery arrangements. The users of the system are getting linked to a variety of sources and systems internally. The organization is becoming more flexible. The system is gradually becoming more accountable to end users as everything is now registered and documented and the processes are becoming transparent.
- ii) People: With e-government making inroads in NDMC, the traditional workforce has to undergo a sea change with the changing requirements of business. For example, they are getting used to computer skills and attempting to overcome the traditional way of doing business. Initial resistance by employees to e-government was natural; management and human resources departments have to educate the employees about the virtues of e-government.

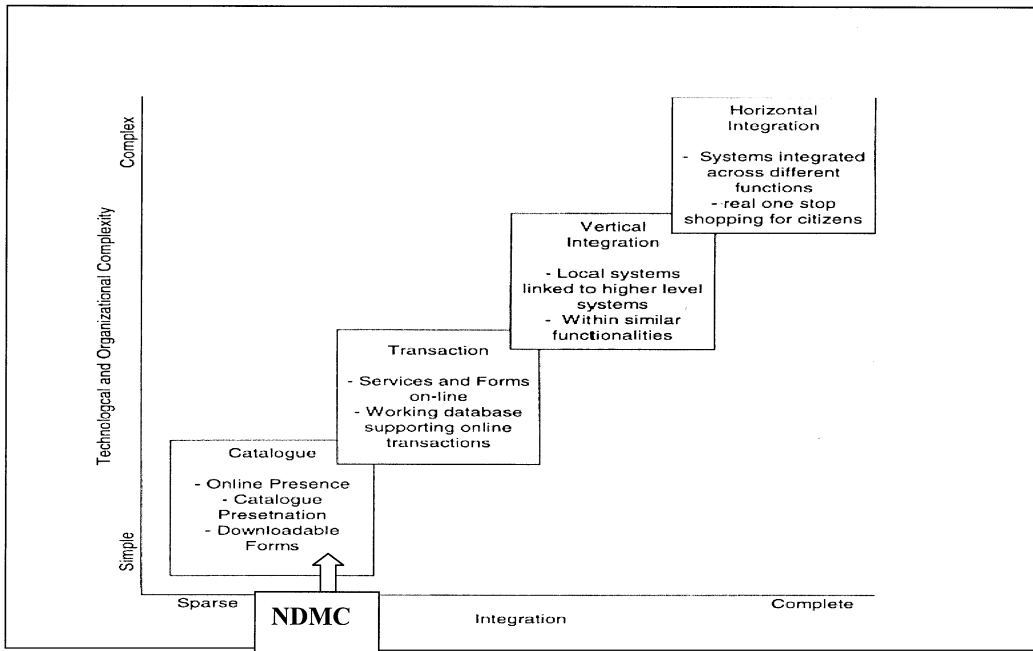


Fig. 2. Adapted from 'Developing fully functional E-government: A four stage model' by Layne & Lee.<sup>26</sup>

- iii) Prospects: Resistance to change has already been witnessed while implementing e-government projects in NDMC. It will be lessened once communication channels are made open and proper. In the future, going by the work culture in governmental departments, it is expected that the status quo would be maintained or there would be incremental implementation rather than a radical adaptation to the digital world. This may be the right approach as the general public is gradually educated about the benefits of e-government along with the employees of the government.

### 3.7.6. Hierarchy for return on e-government for NDMC

This refers to developing a functional view of the organization, identifying specific functions at various levels of management to analyze how IT is able to improve those functions and develop Measurement of Performance for them. This will result in a hierarchy of measures (Table 5), attributable to the benefits of e-government, both tangible and intangible, which emphasizes the strategic role of IT. This orientation is more relevant for India, where the data collection and statistical efforts are very high, but the use of information is very limited.

## 4. Discussion

From the results obtained from the given framework, it may be observed that strictly in financial terms, net incremental revenue cannot be measured vis-à-vis investments made so

Table 5  
Measuring performance of e-government

Hierarchy		Performance
Level 1	ROI	Fundamentally for NDMC is a service organisation and does not need IT to be competitive and IT cannot be considered in isolation, hence ROI cannot be properly justified. Moreover all the benefits cannot be quantified in monetary terms. Hence they cannot be justified in terms of the initial investment made.
Level 2	Total Costs and Revenues	Initial investment made by NDMC to CMC is Rs 2 crore payable in installments after each module is implemented. This cost excludes the hardware components. This amount is funded entirely in-house as NDMC is cash rich. It is estimated that due to improved operations, automation and proper documentation and transparency, incremental revenue will increase over the years, but exact figures are yet to be estimated. Due to automation time requirement is less for a certain job leading to improved employee productivity. There would be, therefore, a savings in manpower (if this is estimated with man-hour rate, which is calculated by dividing total revenue earned, divided by the number of employees.) The revenue streams have to be discounted at actual internal rate of return for NDMC by which they make their investments.
Level 3	Improvement in Quality of Planning and Control	Managerial decision taking time has improved significantly so far as degree of automation is almost 85%. But there is no change in hierarchical control of decision-making. As information flow is comparatively fast and accurate. Planning and control have improved.
Level 4	Quality of Decisions	Tax processing, processing and issue of birth and death certificates have improved significantly. Time required to take any decision has reduced to one quarter of the original time. Frequency of decision making has also increased. But exact calculation about time savings couldn't be done, as there is no attempt to maintain systematized time sheets. Certain data are common and available throughout all departments. A centralized data base system allows faster data access thereby reducing decisions making time.
Level 5	Value of Information	Due to automation, information generated is more frequent and the time required is less. However in terms of validity, reliability, relevancy, and message content, it is assumed to be better but so far the exact value of information in the prescribed terms cannot be ascertained.
Level 6	System Characteristics	IS for e-government has contributed greatly in the performance of NDMC so far with select modules: More and better interface Grievances now directly reach to appropriate authority who is supposed to address the issue Reduction in time for any business operation More transparency Process improvement whereby lag time is reduced to almost half. Better collection of revenues in terms of tax and approval Online downloading forms and many cases filling taxes online too All relevant information available online

far because the whole module has not been implemented and no calculation has been done for determining incremental revenue. After proper documentation for a certain period of time, the incremental business transaction and, correspondingly, incremental revenue can be calculated. Maintaining timesheets can also give vital clues about savings in manpower. If this exercise is done, at least the payback period can be estimated. However, to actually calculate the breakeven period with NPV, the exact cost of capital needs to be calculated.

In benchmarking we have seen that although NDMC has done well compared to smaller municipalities, but its performance with comparable municipalities has left a lot to be desired. The main drawback of NDMC, to this point, is the inability to transact online with citizens. NDMC has no score for this parameter. Maybe by the end of the year, after going fully online, NDMC's score will shoot up considerably.

Since similar municipalities could not be studied due to lack of data, comparison on a scoring model cannot be made. However, based on the different criteria, the weightage points that have been given which would be the same with the other municipalities as well.

Being in the initial stage, NDMC could only manage to achieve Cataloguing stage of the growth model. Based on the rate of NDMC's progress, it is expected it can achieve Stage II at the end of 2003 or the beginning of 2004. Almost all governmental organizations in India are still hovering around the first stage of cataloguing activities with just a cosmetic presence and only a bare minimum of information and few achievements. Very few sites have downloadable forms. Several state government sites such as Madhya Pradesh, Karnataka, and Andhra Pradesh have progressed further with detailed information systems. Still, online transaction processing, complaints records, and tax filing have yet to be introduced. Further steps to integrate horizontally and vertically across local systems, which in turn are linked to higher level systems within a similar functionality, and across different functions by becoming a real one stop shopping for citizens is still a tall order. Cities like New York had a sizeable lead-time with plenty of investment, which Indian cities find difficult to match. Other important challenges in the Indian context include the security of systems, the privacy of customers, and the maintenance of sites once Stage II or higher stages are to be integrated.

In the "Return on e-government model" (Table 5), we see that for Level 6, the required information is available from the select modules in operation. Being a service type of organization, the value of information for NDMC cannot be fully established as it is difficult to quantify. Due to centralized data systems, as well as the ease of data retrieval and proper documentation, the quality of decisions have definitely improved. Hence, it can be opined that NDMC has achieved Level 4.

So far, there is no change in hierarchical control on decision-making and the organization is still vertical in structure. So progress to Level 3 in the hierarchy has not been achieved so far. Only the costing part is known to the authority. The incremental revenue generation or savings in manpower is still not worked upon. NDMC is yet to reach Level 2. Being a service organization, ROI as a quantitative measure cannot be strictly ascertained. Here change of productivity cannot be solely attributed to numbers only. Hence, Level 1 hierarchy is not applicable for NDMC.

The psychological aspects have so far not hindered the progress of implementing the e-government project, at least with the employees. But NDMC needs aggressive marketing and brand building to educate the end users, that is, the general public who are its customers,

about the virtues of the initiatives. A certain number of man-hours every year should be devoted to training employees to let them understand the benefits of e-government. For example, in various government owned banks, there was a lot of initial resentment to computerization and online solutions because of the fear of loss of power or jobs, but training and communication gradually have brought about a change in attitude. Some people now refuse to work if the system is not functional.

One of the most important challenges for evaluating e-government projects is not in technology but in the availability of a competent workforce. Government employees need to move away from a traditional mindset and acquire the confidence needed to innovate in the workplace since e-government has changed the style of doing business. Only time will tell how much Indian e-government initiatives will take to the opportunities presented by e-government.

The other sociological aspect, from the point of view of end users, is concern about privacy and security issues. For online transactions, queries, and complaints, complete secrecy should be maintained. Transmission of data should be absolutely safe and secure. If this is not possible, the very concept of e-government will be at stake and it becomes needless to talk about its evaluation. Moreover, downtime for complaint registration and addressing the same should be less compared to the old brick and mortar model.

## **5. Concluding remarks**

Evaluation of e-government projects may yield meaningful results. To perform a reasonable cost benefit analysis, all the financial data has to be made available. As a guideline, it makes sense to recommend the discarding of projects with a long break-even period. Moreover, newer technologies would become a part of a system, and the organization might have to migrate to that new technology platform. Hence, existing project costs would all become sunk costs and hit hard on the organization's exchequer, especially in organizations with financial constraints. As there are no concrete available resources for evaluating these types of projects, the framework explained in this paper provides a direction about for consideration of the evaluation of e-government projects in the future. The case study of NDMC provides an illustrative reference for future evaluation. This model would be beneficial for evaluating any other municipality in the country and also comparing its performance with municipalities of other countries. But the selection of various soft and hard measures will depend on the system profile, the type of services being offered, and the profile of the citizen being served. The qualitative analysis of benefits is highly subjective and will differ from person to person, but an overall evaluation could be ascertained in the broader framework discussed in this paper. The framework provided is by no means optimal. Based on other ideas and research, the framework can be changed for which the grading and, subsequently, various qualitative aspects of measurements could change. Although care has been taken to include all possible aspects of evaluation of e-government projects in the context of India, there might be an omission of some points and corresponding methodologies for its evaluation. Further case studies would have been helpful in gauging the various

qualitative aspects of evaluation. A comparison can also be done among the websites of the organizations and composite scores with ranking can then be generated.

## Notes and references

1. West, D. M. (2002). *Global e-government, 2002*. Available: <http://www.insidepolitics.org/egovt02int.html> (Accessed 30 March 2003).
2. Caudle, S. L. (1995). Reengineering for results: Keys to success from government experience *Section 5: Measure and Track Performance Continuously*. Available: <http://www.c3i.osd.mil/bpr/bprcd/3002s5.htm> (Accessed 30 March 2003).
3. Cook, M. E. (2000). *What citizens want from e-government*. Available: [http://www.ctg.albany.edu/resources/abstract/abwhat\\_citizens\\_want.html](http://www.ctg.albany.edu/resources/abstract/abwhat_citizens_want.html) (Accessed 30 March 2003).
4. Matthews, W. (2000). *Experts: E-gov examples shine abroad*. Available: <http://www.fcw.com/fcw/articles/2000/1225/web-survey-12-26-00.asp> (Accessed 30 March 2003).
5. Office of Management and Budget. (2002). *Budget of the United States Government, Fiscal Year 2003, Governing with Accountability*. Washington, DC: Author.
6. West, D. M. (2000). *Assessing e-government: The Internet, democracy, and service delivery*. Available: <http://www.insidepolitics.org/govtreport00.html> (Accessed 30 March 2003).
7. West D. M. (2002). *State and federal e-government in the United States, 2002*. Available: <http://www.insidepolitics.org/Egovt02us.html> (Accessed 30 March 2003).
8. Allen A. B., Juillet L., Paquet G., & Roy J. (2001). E-government and government on-line in Canada: Partnership, people and prospects. *Government Information Quarterly, 18*, 93-104.
9. West, note 1 above.
10. De Rajneesh & Srikanth R.P. (2001). *E-government gets going in fits and starts*. Available at <http://www.expresscomputeronline.com/20011224/focus1.shtml> (Accessed 30 March 2003).
11. De Rajneesh & Srikanth, note 10 above.
12. India case studies. (2003). *Andhra Pradesh land/property registration, computerized interstate check posts in Gujarat*. Available: <http://www1.worldbank.org/publicsector/egov/india.ht> (Accessed 30 March 2003).
13. Mingers, J. (1997). Towards critical pluralism. In J. Mingers & A. Gill (Eds), *Multimethodology: Theory and practice of combining management science methodologies* (407-440). Chichester: Wiley.
14. Wolstenholme, E.F. (1999), Qualitative versus quantitative modeling: The evolving balance. *Journal of the Operational Research Society, 50*, 422-428.
15. Munro, I., & Mingers, J. (2002), The use of multimethodology in practice—results of a survey of practitioners. *Journal of the Operational Research Society, 53*, 369-378.
16. Seitz, N. E. (1989). Capital budgeting and long term financing decision. Hinsdale IL: Dyden Press; Khan, M. Y., & Jain P. K. (2001). Capital budgeting: Principles and techniques. In *Financial Management* (171-273). New Delhi: Tata McGraw-Hill Publishing Company.

17. Glazer, A., Kannianen, V., & Niskanen, E. (2002). Bequests, control rights, and cost–benefit analysis. *European Journal of Political Economy*, 19, 71-82.
18. Shinjo, K., & Zhang, X. (2003). Productivity analysis of IT capital stock: The U.S.A.–Japan comparison. *Journal of Japanese International Economies*, 17(1), 81-100.
19. Brynjolfsson, E., & Hitt, L. M. (1998). Beyond the productivity paradox. *Communications of ACM*, 41(8), 49-55.
20. Kaylor, C., Deshazo, R., & Eck, V. D. (2001). Gauging e-government: A report on implementing services among American cities. *Government Information Quarterly*, 18, 293-307.
21. West, note 6 above; Stowers, G. N. L. (1999). Becoming cyberactive: State and local governments on the World Wide Web. *Government Information Quarterly*, 16(2), 111-127; Johnson, K. L., & Misic, M. M. (1999). Benchmarking: A tool for web site evaluation and improvement. *Electronic Networking Applications and Policy*, 9, 383-392; Norris, D. F., Fletcher, P. D., & Holden, S. H. (2001). Is your local government plugged in? Highlights of the 2000 electronic government survey. Prepared for the International City/County Management Association (ICMA) and Public Technology, Inc. (PTI). Available: <http://ti.nw.dc.us/links/egovernment.html> (Accessed 30 March 2003).
22. Kaylor, Deshazo, & Eck, note 22 above.
23. Green, C. B. (1993). *Benchmarking the IT function*. New York: The Conference Board; Turban, E., & McLean, E., & Wetherbe, J. (2001). *Information technology for management, making connections for strategic advantage*. New York: John Wiley & Sons Inc.
24. Kaylor, Deshazo, & Eck, note 20 above.
25. Turban, McLean, & Wetherbe, note 23 above.
26. Layne K., & Lee J. (2001), Developing fully functional e-government: A four-stage model, *Government Information Quarterly*, 18, 122-136.
27. Feltham, G.A. (1972). *Information evaluation*. Sarasota, FL: American Accounting Association.
28. Gupta M. P. (1999). Assessing return on information. *South Asian Journal of Management*, 6(3&4), 1-19.
29. Available on <<http://www.ndmc.gov.in>>.
30. News item in *The Times of India* (29 March 2003), p.2
31. Kaylor, Deshazo, & Eck, note 20 above.

## Acknowledgments

The authors acknowledge with gratitude the suggestions made by the reviewer (s), which has helped in the reorganization of the paper. The authors would also like to thank Dr. Shiv Srinivasan of IIT Delhi for his suggestions on the stylistic aspects of this paper.