

Research Article

Assessing the Impact of E-Government: A Study of Projects in India

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Abstract

In recent years, there has been extensive investment in e-government throughout the developing world. Still, little is known about the impact of those investments, partly due to a lack of assessment guidance. This paper reports development of an assessment methodology that could be used in developing countries to justify investments in e-government, as well as to establish a performance benchmark for future projects. This framework identifies key stakeholders, dimensions on which the impact needs to be measured, and a methodology of measurement. Client value is measured primarily in two dimensions: 1) cost to the client of accessing services, and 2) perception by the client of quality of service and governance. In a limited way, the financial cost-benefit impact to the agency implementing the project is also studied.

The paper takes India as its example location for application of the framework, presenting assessment results from eight e-government projects which estimate the difference between client ratings of computerized and (earlier) manual systems. Clients indicated an overwhelming preference for computerized service delivery, with reports of fewer journeys, less waiting time, and some reduction in corruption (marginal in places).

The results provided a tentative affirmation of the improvements that may be possible through the use of ICTs in delivering government services in developing countries. Overall impact showed wide variation across projects, highlighting the need to pay greater attention to process reform in the design of e-government projects. Measurement of direct monetary benefits to the clients provides a basis for determining the service fees that could be charged. An assessment of incremental costs of processing a transaction can help evaluate the feasibility of a public-private partnership model.

The Government of India has adopted the framework used in this study to assess the impact of all mature projects implemented at the national, state, and local levels.

1. Background

In recent years, a number of developing countries have launched e-government programs,¹ and several development agencies and govern-

1. Two examples from Asia are the e-Sri Lanka Development Project, launched in Sri Lanka in 2004 through World Bank assistance, and the National e-Governance Plan (NeGP), launched by the Government of India in 2006. Among the developing countries, those in Latin America appear to have been somewhat ahead in the implementation of e-government programs. For example, the Colombian government launched the "Connectivity Agenda" in early 2000 to provide a strategic framework for e-government implementation in all federal government agencies. Similarly, Brazil's federal government launched the Information Society program in 2000 to guide e-government initiatives in the country. See Heeks (2002) for an early discussion of various types of applications such as eServices, eAdministration, and eSociety implemented in African countries.

ments have identified e-government implementation as a key policy priority. Driven by the success of a few projects in improving delivery of services to citizens and businesses, an increasing number of governments are making ICT investments in the public sector. On the other hand, evidence of failed projects has drawn attention to the level of risk involved in implementation. A failure rate of more than 50% is widely cited in this context (Heeks, 2008).

A study² undertaken by Basant et al. (2006) researched firm-level impact of ICT in developing countries, but similar studies have not been undertaken for the public sector. A report by the United Nations (2003) laments the fact that documented research on the social or economic impact of e-government is virtually non-existent. A World Bank report (2002) notes that the largest, yet least monitored investments are ICT components of projects in different sectors, highlighting the relevance of systematic assessment of the impact of these applications. The eGovernment Unit of the European Commission (2006) noted that “[a]fter at least a decade of large investments (running into billions of Euro) [aimed] at digitalizing the public sector, governments in Europe are still mostly unable to objectively quantify and show the benefits and returns of such investments.”

The impact study of the eight e-government projects for which results are reported in this paper was partially sponsored by the World Bank, with an objective of developing a methodology of assessment that could be used in developing countries to justify investments in e-government projects and establish a performance benchmark for future projects.³ The first step in the study was to develop a framework for assessment by defining the variables on which impact would be measured and a method-

ology for measurement in a developing-country context. A literature review of the broader theme of evaluation was carried out to draw broad input for the development of a framework.

The next two sections present the literature review and the key features of this framework. The paper goes on to report the findings from two studies⁴ that used the framework to assess the impact of eight e-government projects from India.

2. Literature Review: Developing a Framework for Impact Assessment

Review of the literature suggests that academic research on evaluation of e-government projects is clustered around two aspects:

1. The first group of studies assessed a number of projects post-implementation with a great deal of variation in terms of “what was measured” and the methodologies used or “how the measurements were carried out.” These studies,⁵ largely anecdotal and done in piecemeal fashion, provide project-level evaluations with little prospect for generalization (Bhatnagar, 2009, p. 134; Bhatnagar & Schware, 2000).

Some studies examined the implementation process within the agency to evaluate whether the systems were functioning as they were designed to, or the degree to which the intended outcomes were achieved (Madon, 2009). Some studies looked at long-term sustainability and scope for replication of a project (Kumar & Best, 2006), while some measured the benefits that were delivered to agencies.⁶ A few focused on benefits to the clients.⁷ A study reported savings from a number of e-government projects in Brazil by comparing operating costs in the implementing agencies before and after com-

2. The study, commissioned by the UK Department for International Development (DFID) at the London Business School collected data from firms in India and Brazil to establish a relationship between ICT investments, profitability, growth, and productivity at the firm level. The degree of collateral organizational change was studied as a mediating variable.

3. For further details of the purpose of the study, study coverage, and the consultation process in developing the framework for the study, see World Bank (2007).

4. The two studies were undertaken by the Indian Institute of Management, Ahmedabad (IIMA) in 2006. The first was funded by the World Bank, Washington, DC, and the second was funded by the Department of Information Technology, Government of India. The first author was the study team leader, and the second was the lead staff researcher in both studies. T. P. Rama Rao of IIMA was also a part of the study team.

5. For example, the Department of Information Technology, Government of India (2006) had commissioned a quick assessment of 29 projects in 2005–2006.

6. The Public Procurement Service, the Republic of Korea (2009), has evaluated the impact of its e-procurement implementation on different government agencies using the system.

7. The Global Knowledge Sharing Program (2002) got four Indian projects evaluated where clients were surveyed.

puterization (Crescia, 2006). Another study evaluated the performance of 19 country veteran service offices, using a balanced-scorecard approach based on content analysis of websites (Lawson-Body et al., 2008). Some of the evaluations had been carried out by hardware vendors, consultants (Gartner, 2002; HP, 2002) and agencies that were likely to be seen as being biased toward showing a positive outcome.

The methodologies used by these studies include surveys, expert opinion, ethnographic studies, and internal assessments carried out by lending agencies. The utility of such evaluations has been limited because:

- Whereas the studies provided some basis for justifying investments in the assessed projects, no benchmarks could be established for future projects, as a common list of performance measures was not used in such studies.
- Different studies of the same project showed very different outcomes, thus indicating a lack of credibility of results.⁸ Part of the reason for different outcomes was the use of very small samples, as well as a lack of rigor in sampling and collecting data from clients of the systems. The results could therefore not be easily generalized over the entire population of clients.
- The studies evaluated the functioning of the computerized system, but they were not able to assess the difference made by ICT use, as the need for counterfactuals (evaluation of systems as they worked before computerization) was ignored. Often, the impact of ICT use was not separated from other interventions that were made simultaneously with the computerization effort.

2. The second group of studies focused on developing a framework for measurement of value delivered to different stakeholders. Different components of value are identified, and a methodology of measuring the performance of each element proposed. Frameworks are expected to be applied to individual projects, either *ex ante* to determine whether the project needs to be implemented at all, or *ex post* to make a judgment on its success.

A number of such approaches were analyzed to develop a framework for the proposed assessment of e-government projects in India. Among these were the following: MAREVA (A Method of Analysis and Value Enhancement), developed by the French Electronic Administration Development Agency (ADAE) and Bearing Point (2005); WiBe Economic Efficiency Assessment methodology (Federal Ministry of the Interior, Germany, 2004), being used by the German federal administration; the eGEP measurement framework developed by the European Commission (2006) on the basis of a review of MAREVA, WiBe, and other frameworks developed in the UK, Holland, and Denmark; and a paper on understanding and measuring e-government (Heeks, 2006).

MAREVA provides a detailed method of computing costs and gains for an agency to calculate the expected return on investment (ROI) before a project is taken up. However, it suggests four other parameters on which a project should be assessed—necessity of the project, level of risk, benefits to employees and society, and concrete benefits to clients. Each of the five parameters is rated on a five-point scale and presented as a radial diagram for all projects being compared. The key benefits for the clients are identified as gain of time, saving of money, and simplification of accessibility.

WiBe is an approach that has been used for a decade for assessment of IT projects in Germany. It provides very detailed templates for calculating costs and revenues, templates that were useful in developing the method of assessing investments, operating costs, and revenue impacts for the agency in our framework.

The eGEP framework (European Commission, 2006) is built around the three value drivers of efficiency (organizational value), democracy (political value), and effectiveness (user value), and it is “elaborated in such a way as to produce a multidimensional assessment of the public value potentially generated by eGovernment, not limited to just the strictly quantitative financial impact, but also fully including more qualitative impacts.”

Heeks’ paper reviews a number of papers and discusses the important issues of “why benchmark,” “what to benchmark,” and “how to benchmark”

8. For example, the *Bhoomi* project that issues copies of land titles has been evaluated by the Public Affairs Centre, Bangalore (2002), which reports significant positive outcomes, including reduction in bribes. A study by a team from the International Institute of Information Technology, Bangalore (2005) found that corruption had not declined, and that major benefits were derived by so-called “land sharks.”

e-government projects, particularly in the context of developing countries. He discusses an “e-government value chain”—a summary of the way in which e-government turns inputs into outcomes. Indicators such as “Satisfaction rating with particular e-government services,” “Level of citizen complaints about e-government service,” and “Perceived improvement to information access” measured through mass citizen surveys or pop-up surveys are proposed as benchmarks for outputs. Similarly, citizen benefits, agency cost savings, and process changes are indicated as impact measures, with time saved for citizens identified as an indicator for citizen benefits. He points out that the focus of benchmarking studies has been Web-based communication delivered via a personal computer (PC) accessed directly by the recipient. He argues that, even in industrialized economies, this reflects neither practice nor preference in interaction with government.

Most of the approaches and assessment models discussed above have not been used in the context of a developing country.⁹ Models for developing countries need to account for a variety of delivery models used in those countries, such as common service centers and franchised outlets that can retail e-services offered by the government. Practical issues of paucity of data also need to be considered in the case of developing countries where baseline surveys are rarely done and monitoring and evaluation systems are weak.¹⁰

3. Measurement Framework and Methodology Used in the Study

In the development literature, impact assessment is defined as “the systematic analysis of the lasting or significant changes—positive or negative, intended or not—in people’s lives brought about by a given action or series of actions” (Roche, 1999). It is difficult to use this definition to develop an assessment framework in the context of e-government. Among the many case studies of e-government projects, none has claimed that electronic delivery of a few services can produce a lasting change in the behav-

ior of the people. Any such change can only be expected to occur over long periods of time, but long-term change introduces other complications, such as attribution of the change to a single type of intervention. The proposed framework therefore focused on measurable outcomes that could be directly linked to e-delivery of services.

The framework focused on two core ideas emphasized by each of the frameworks reviewed earlier—measuring the total value delivered by a project to different types of stakeholders, and identifying multiple components of the value that would need to be measured in different ways, reflecting a variety of outcomes experienced by each type of stakeholder. The framework used for the study was developed in 2005–2006 and is presented in Table 1. The table presents, for each stakeholder, the multiple dimensions of value that are relevant in a developing country context, and it also identifies sub-elements of each dimension that can be measured through a structured survey.

The list of sub-elements was not borrowed directly from any specific approach discussed above. These elements were identified by analyzing the intended outcomes in a number of case studies of e-government projects from developing countries. Some specific elements were taken from a framework developed earlier by a team of researchers and practitioners in India (Rama Rao et al., 2004). A number of researchers with varied experience of e-government projects from different countries were used as a sounding board to review the list¹¹ prior to the finalization of the sub-elements in Table 1. For each sub-element, other frameworks that also include the sub-element have been referenced in Table 1, though the way to measure some of the elements in this study was different from that used in the other frameworks, due in part to the developing-country setting.

Overall, the framework identifies an e-service delivery project as impacting three groups of stakeholders: a) the clients receiving the service; b) the agency (including implementation partners) that delivers the service; and c) the wider society consist-

9. This conclusion was reported after an analysis of evaluation documents of 73 projects from more than a dozen developing countries (World Bank, 2007, p. 48–54).

10. Even in the context of the eGEP framework (European Commission, 2006), it was noted that “most of the data needed for the relevant indicators will have to be constructed and gathered from scratch.”

11. More details of the review process and the researchers involved are provided in World Bank (2007, pp. IV–VI).

Table 1. Key Outcome Dimensions.

Stakeholders	Key Dimensions of Impact
<i>Client</i>	<ul style="list-style-type: none"> ■ Cost of accessing service measured directly <ul style="list-style-type: none"> • Travel cost due to the number of trips made to the office for the service and distance traveled (EAF, eGEP, MAREVA, WiBe) • Estimate of wage loss due to time spent traveling to the office for the service and waiting in each trip (eGEP) • Total time elapsed in receiving the service (EAF, eGEP, MAREVA, WiBe) • Amount paid as bribes to functionaries or as service charges to agents to facilitate service (MAREVA) ■ Quality of governance measured on a 5-point scale <ul style="list-style-type: none"> • Extent of bribery in the working of the system (EAF) • Extent to which functionaries can be held accountable for their actions (eGEP) • Transparency of rules and procedures (eGEP, MAREVA) • Availability of a mechanism to provide feedback to the agency and its effectiveness (EAF, eGEP, MAREVA) ■ Quality of service measured on a 5-point scale <ul style="list-style-type: none"> • Quality of interaction with functionaries in terms of their courteousness and friendliness (EAF) • Satisfaction with the mechanism for complaint handling and problem resolution (EAF, eGEP, MAREVA, WiBe) • Perception about the confidentiality and security of data (eGEP) • Convenience of working hours and ease of access to service (EAF, eGEP, MAREVA, WiBe) ■ Overall assessment <ul style="list-style-type: none"> • Preference for the computerized system as opposed to the manual system • Composite score measured on a 5-point scale by factoring in the attributes of a delivery system that are seen as being important by users
<i>Agency (including partners in implementation)</i>	<ul style="list-style-type: none"> ■ Economic impact measured directly <ul style="list-style-type: none"> • Increase in revenue through increased compliance by taxpayers, wider base of taxpayers, collection of user fees from clients, reduced leakage due to less fraud and corruption (EAF, eGEP, MAREVA, WiBe) • Reduced cost of office space, paper, manpower, and travel (EAF, eGEP, MAREVA, WiBe) ■ Quality of governance measured on a 5-point scale <ul style="list-style-type: none"> • Extent of corruption among employees • Accountability, measured as the ability to trace decisions and actions to employees (eGEP) • Transparency of decisions, procedures, and information for internal and external clients (eGEP, MAREVA) • Participation, measured as the involvement of employees in internal decision processes (EAF, eGEP) ■ Performance with regard to key non-economic objectives, such as improved targeting of clients or equity in coverage, measured on a 5-point scale (EAF, eGEP, MAREVA, WiBe) ■ Process improvements resulting in reduction in employee workload, improved work environment, and supervisory control, measured on a 5-point scale (EAF, eGEP, MAREVA, WiBe)
<i>Society/government as a whole</i>	<ul style="list-style-type: none"> ■ Long-term impact on Millennium Development Goals measured on a 5-point scale ■ Image of the government measured on a 5-point scale (WiBe)

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ing of citizens, businesses, government as a whole, and civil society. The framework recognizes that some part of the value for each stakeholder can be monetized, and that other parts need to be assessed qualitatively. It rejects the traditional approach of calculation of net economic benefit of an ICT project, which has proven to be challenging, as outcomes are multi-dimensional and composed of both quantitative and qualitative indicators. This reflects the argument in other evolving frameworks that an exclusive focus on financial costs and benefits for the government ignores many important non-economic benefits (Lau, 2005). One such benefit relates to improvements in various aspects of governance activity.

E-government systems frequently encompass strategic goals that go beyond efficiency, effectiveness, and economy to include political and social objectives, such as trust in government, social inclusion, community regeneration, community well-being, and sustainability (Grimsley & Meehan, 2007). In countries where a large number of public agencies begin to deliver services electronically, such long-term impacts may indeed happen. Such impacts are included in Table 1, under the last section on society and government as a whole.

For each project, the measurement framework was converted into a set of data collection instruments, including the following: a) a profile of the project identifying services, clients, and other stakeholders; b) agency-level data on activity levels, investments, and operating costs; c) a client survey questionnaire covering direct cost of access, quality of service and governance, and a few measures of overall satisfaction; and d) an employee survey for understanding perceived impact on work, efficiency, and effectiveness. Measurement of impact on society through sub-elements like trust requires further work, and it is not reported in this paper. The client survey assessed both the manual system and the computerized system that replaced it on all four dimensions listed in Table 1. An analysis of the differences between the old and the new system provided a measure of impact.

The sampling methodology was designed to cap-

ture variability in the factors that determine performance of service centers. Therefore, selection of delivery centers was based on stratification on the number of clients served annually by the delivery centers and development indexes of the subdistricts in which they were located. Respondents were selected from villages located both near and far from the delivery centers. The sample size was determined on the basis of the number of service delivery centers to be selected, the number of locations (cities, towns, or villages) within the catchment area of each service center from which users were to be selected, and the number of users from each location.

The framework has the following elements and features that are especially relevant in the context of developing countries:

- Its primary focus is on the impact of clients' costs of accessing services. The delivery mode is assumed to be an assisted service center, unlike many studies that assume self-use through a portal. Therefore, costs include "number of trips made to offices/delivery centers" in addition to waiting time. Unlike in industrialized countries, bribes form a significant part of the cost of accessing services¹² in developing countries (Bhatnagar, 2009, p. 49; Transparency International, 2005). The framework attempts a direct measurement of impact on bribes, in addition to the other aspects of quality of governance.
- The framework defines a detailed methodology of "how to assess the impact." A structured survey of clients was carried out by market research agencies to assess performance (on parameters defined in the framework) of the manual and computerized system from an adequately large, random sample of users. Sampling methodology was designed to capture the smallest impact and provide accurate estimations for the entire population of millions of clients served by each project.
- In addition to the three to four distinct dimensions on which the impact of each project can

12. A 16-country survey on governance (Hyden et al., 2004, p. 36) reported about bribes in India that "Foremost is the widespread sense that it is difficult to get anything done without bribery. As one of our respondents dejectedly put it: 'Right from birth to death nothing happens without bribery and corruption. People can neither live nor die with dignity.'"

be measured, a method is provided to capture an overall rating for a project's impact, based on a qualitative assessment of a set of comprehensive factors covering cost, governance, and quality. A single measure allows comparisons to be made across projects of different types.

4. Results of Client Impact Assessment

The primary objective of the study was to measure the impact of computerization on clients (users) of selected service delivery projects, and to test the applicability of the framework across a variety of projects. For the purpose of this study, a sample of eight mature projects¹³ across three states in India was selected (Table 2, giving project URL where available). These projects had been in operation for a period ranging from three to eight years. The projects covered a variety of delivery modes, services, and clients. They covered services to rural, as well as urban, citizens (G2C), services to businesses (G2B), and services for internal government users (G2G). Most of the services are offered by state-level agencies, except in eSeva, where services from the federal government are also offered. In the eProcurement project, services are accessed through a portal. In the remaining projects, service delivery is through assisted computerized counters set up by the agencies at 200–300 locations spread across the entire state.

Three of these projects—eProcurement, eSeva, and Gujarat's computerized interstate check posts—were developed, implemented, and are operated by private partners. The remaining projects had varying degrees of involvement by private partners in their development, but are operated by the implementing agency itself.

Random samples of about 30 users were chosen from each of eight service center locations in a state. The chosen service centers represented different levels of activity, and were located in regions with different levels of development. For example, in the case of Bhoomi, 242 respondents from eight

sub-districts across seven districts (out of a total of 21 districts and 201 sub-districts, each having a Bhoomi service center) were surveyed. Each service center serves a cluster of 10 to 20 villages, from which three were selected—one from the periphery of the sub-district headquarters, the second a nearby village (within a distance of 10 kilometers), and the third a far village (beyond a distance of 30 kilometers). Of the total sample of 242, roughly 71% can be classified as rural, and 29% can be classified as urban.

The questionnaires were translated into the local language and administered at the home of the sampled users by investigators who were trained to understand the nature of projects, as well as to interpret individual items in the instrument. The survey was combined with secondary documentation and primary data gathered through field visits, interviews, surveys, and opinions solicited through e-mail.

This section presents an analysis of the impact of the eight projects from the perspective of the clients. Impacts for the key dimensions of cost, quality, governance, and overall satisfaction are presented.

A. Cost to Users

In all eight projects, e-government has reduced the number of trips users have to make to complete all transactions for a service (Figure 1). Greater formalization of processes after process reform, quicker retrieval of data from computerized databases, and automation of tasks, such as writing and copying of documents, as compared with manual methods, has reduced the total processing time of a service request in all applications.¹⁴ This has resulted in increased predictability in service delivery and reduced the number of trips.

A reduction in the number of trips implies a reduction in travel costs. The only exception is the Bhoomi project, where travel costs have increased, primarily because the location of the office that issues the RTC has been shifted from the village level to a *taluka*¹⁵-level government office. However, 800 rural kiosks are being put up by a private opera-

13. *The importance of assessing mature projects has been recognized in other evaluation studies in the context of developing countries (Gupta & Jana, 2003).*

14. *For example, in the case of AMC, the time elapsed has reduced from 9.8 days to 5.3 days for certain types of transactions, while in CARD, the total time required for registrations has come down from 4.7 to 1.8 days.*

15. *Taluka (or sub-district) is an administrative division consisting of a city or town that serves as its headquarters, possibly additional towns, and a number of villages.*

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Table 2. List of Eight Projects for Detailed Study.

Project Description	Launch Date and Type
KARNATAKA	
<p>1. <i>Bhoomi</i> (http://www.revdept-01.kar.nic.in/)</p> <p>Online issue of a record of right, tenancy, and crop certificate (RTC), a document required (one or two times a year) for availing crop loans from banks or as surety for bail, and filing of requests for mutation for effecting changes in land records in Karnataka through 203 kiosks.</p>	February 2001 G2C
<p>2. <i>KAVERI—Karnataka Valuation and E-Registration</i> (http://www.karigr.org/)</p> <p>Key services delivered by 201 sub-registrar's offices in Karnataka are the following: online registration of property sale/purchase deeds, issue of non-encumbrance certificates, and issue of copies of registered deeds. Such transactions are done two or three times in a lifetime, when property is purchased, transferred, or sold.</p>	December 2003 G2C
<p>3. <i>Khajane</i></p> <p>Networking and computerization of all treasuries across Karnataka. Treasuries make payments (such as salaries to staff, payments to contractors, and social welfare and retirement pensions to civil pensioners), accept receipts on behalf of the state government, maintain accounts of these transactions, and submit the accounts to the accountant general of the state.</p>	November 2002 G2G
ANDHRA PRADESH	
<p>4. <i>CARD—Computer Aided Administration of Registration Department</i> (http://www.igrs.ap.gov.in/)</p> <p>Online registration of property sale/purchase deeds, issue of non-encumbrance certificate, and issue of copies of previously registered deeds through 387 sub-registrar's Offices in Andhra Pradesh. Such transactions are done two or three times in a lifetime, when property is purchased, transferred, or sold.</p>	November 1998 G2C
<p>5. <i>eProcurement</i> (http://www.eprocurement.gov.in/)</p> <p>Online tendering for goods and services by government departments and agencies in Andhra Pradesh. More than 32,000 tenders were processed through the eProcurement platform in 2008–09, with an average of three bids received per tender.</p>	January 2003 G2B
<p>6. <i>eSeva</i> (http://esevaonline.com/)</p> <p>One-stop service centers delivering 135 services from central, state, and local governments, as well as public utilities. Used monthly by 3.1 million citizens at 275 locations across 190 towns.</p>	August 2003 G2C
GUJARAT	
<p>7. <i>Ahmedabad Municipal Corporation (AMC) Civic Centers</i> (http://www.egovamc.com/)</p> <p>16 civic centers of AMC primarily deliver three services: annual collection of property tax, issue of birth and death certificates, and issue of shop licenses. About 1.25 million transactions are processed through the civic centers annually.</p>	September 2002 G2C
<p>8. <i>Computerized Inter-State Check Posts</i></p> <p>10 computerized check posts use electronic weigh bridges to levy fines for overloading and over-dimensioning of commercial vehicles passing through them, inspect vehicles to check for damaged headlights and non-standard license plates, and verify essential documents. More than 16 million commercial vehicles pass through these check posts annually.</p>	March 2000 G2B

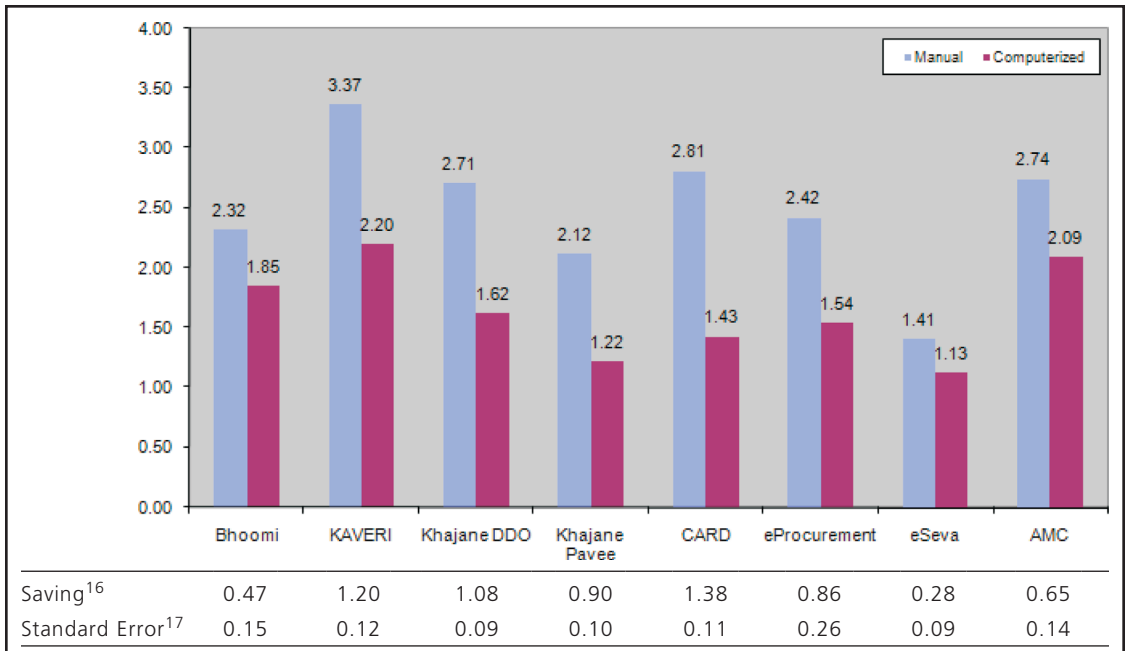


Figure 1. Number of Trips.¹⁸

tor in Karnataka to issue RTCs. These kiosks will access Bhoomi's central server (where all records on the day's transactions in various taluka-level kiosks are updated) to issue RTCs, which would reduce the clients' cost of access.

Waiting time at the service centers has been reduced in all the projects (Figure 2). In general, there was a 30–60% reduction from the waiting time in the manual system. In eProcurement, transactions are done through a portal, so no waiting time is required. Reduction in waiting time has a direct impact on user costs through reduction in foregone wages.

The opportunity cost for users, which can be seen as partly represented by wage loss due to travel and waiting time, is an important component of the cost of accessing services. Recognizing this, the study did attempt to directly measure wage loss, as estimated by respondents. However, wage loss is applicable only when there is extended travel involved in availing service or when the clients are self-employed. Therefore, in most projects, the question related to wage loss did not yield an adequate number of responses for us to be able to make an accurate assessment. In the case of Bhoomi, respondents reported larger wage losses (by an average of

16. The bars in the chart are estimates of the mean "number of trips" based on all the responses for manual and computerized delivery counted separately. Saving has been computed as the mean of the difference for those respondents who provided data on both the manual and the computerized delivery of service. In three projects, a few (less than five out of nearly 240) respondents did not provide data for either the manual or the computerized delivery. Hence, for these three projects, a marginal discrepancy exists between the difference of the manual and computerized systems as seen in the chart, and the saving reported in the table. A similar discrepancy exists for waiting time, governance score, and quality score reported in Figures 2, 3, and 6.

17. The Standard Error refers to the standard deviation of the means of all possible samples (of a given size) drawn from the population.

18. A paired *t*-test was used to assess whether the difference between the number of trips in the computerized and manual systems was significantly different. Test results indicate that the differences were significant at the 99% confidence interval in all eight projects.

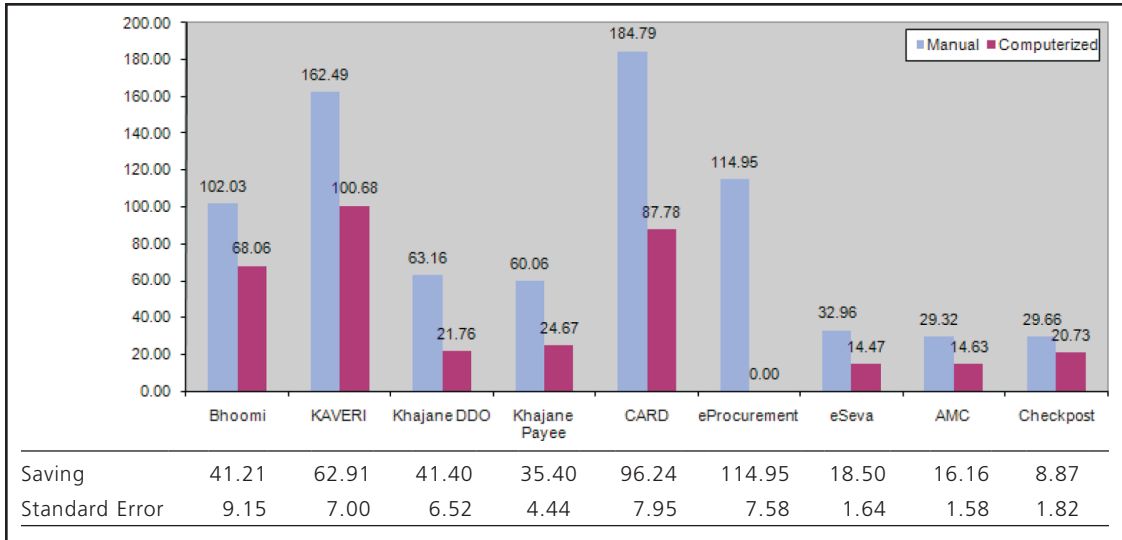


Figure 2. Waiting Time (minutes).¹⁹

Rs 36, or approximately US\$0.80) in the computerized mode, since the distance that they need to travel to obtain RTCs has increased.

While the difference between manual and computerized systems on all the cost indicators is statistically significant (in most cases, at a confidence level of 99%), the accuracy of the estimate of the difference in direct costs could be improved by using larger samples.

B. User Perception of Service Quality

For seven²⁰ of the eight projects, users rated the computerized services higher in overall quality (Figure 3). The differences were statistically significant, though some services, such as eSeva and Bhoomi, have shown a larger improvement in service quality than others, such as eProcurement.

The rate of error in documents (as reported by the users), which is an important measure of quality, was also lower for all the projects except Bhoomi’s issuing of RTCs (see Figure 4). Reduction in errors saves additional trips for users and improves produc-

tivity by reducing additional work for the staff. Pensioners and Drawing and Disbursing Officers (DDOs) in Khajane perceived significant improvements—clearly a huge gain for a treasury system. The anomaly in the one Bhoomi case likely arises because the number of RTCs issued has gone up many-fold after computerization, and even minor mistakes in the name are now being noticed and reported. This is because of the greater legibility of computer-printed documents and the perceived ease of getting errors corrected in computerized systems.

C. User Perception of Governance and Corruption

Although the outcome for reducing corruption appears to be mixed, e-government does seem to have the potential for significant reduction in corruption in service delivery. The proportion of users paying bribes has generally declined. Out of the seven agencies (and eight projects) where significant corruption was reported in the manual system, four were able to eliminate or significantly reduce corrup-

19. A paired t-test was used to assess whether the difference between the waiting time in the computerized and manual systems was significantly different. Test results indicate that the differences were significant at the 99% confidence interval in all projects.

20. CARD was the only exception. It is the oldest among the computerized projects, and neither service area facilities nor queue management were modernized. In all other projects, new facilities were created for interaction with customers. In CARD, error rates barely improved. Unlike similar projects in other states, tasks such as scanning of deeds were not outsourced to private partners. Put together, these factors explain its anomalous result.

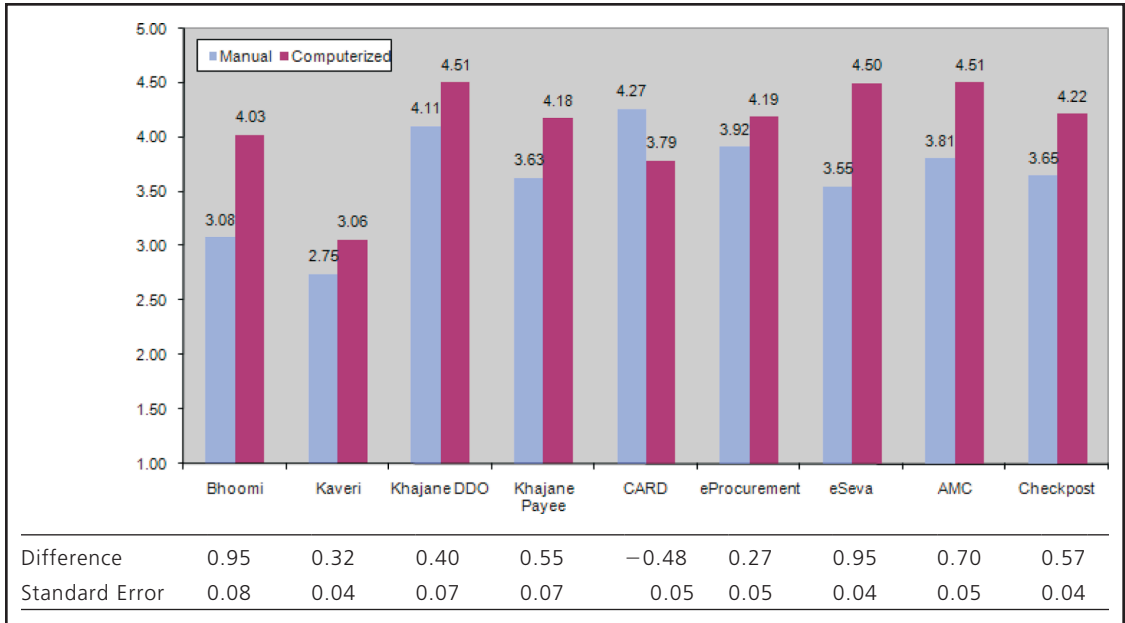


Figure 3. Overall Service Quality Score (5-point scale).²¹

tion through computerization (Figure 5). In the Bhoomi project, while about 30% of users were paying bribes in the manual system, less than 1% are continuing with the practice in the computerized system. Similarly, a significant reduction in the proportion of users paying bribes was seen in eProcurement, which is a G2B project. AMC and Khajane recorded very little corruption following computerization, though they also had relatively low levels of corruption when their business was conducted manually. The impact was marginal in the remaining three agencies, as corruption continued at a significant level, even in the computerized systems. For example, the proportion of transactions in which a bribe was paid in KAVERI continues to be high, at more than 20% in the computerized system.

It has been observed that impact on corruption has been positive in projects where significant process reform has been carried out. For example, implementation of Bhoomi involved simple process reengineering, such as putting a system in place for

processing mutation requests on a first-in-first-out basis, and issuing acknowledgment receipts to clients at the time of accepting a mutation request. On the other hand, in projects like KAVERI, technology has been used to simply automate some parts of the registration process.

The overall governance rating is higher for computerized systems than manual systems (Figure 6). In most projects, there was a marked improvement in transparency and fairness. However, KAVERI showed hardly any improvement in the quality of governance, perhaps, again, due to the limited extent of technology-induced change.

D. Comparison of Projects on Overall Client Impact

Respondents were asked to rate each project on a 5-point Likert scale on 21 common attributes (see Table 3) encompassing the three dimensions of client impact given in the framework—cost of accessing service, quality of governance, and quality of service. As explained earlier, dimensions related to

21. A paired *t*-test was used to assess whether the difference between the overall service quality scores in the computerized and manual systems was significantly different. Test results indicate that the differences were significant at the 99% confidence interval in all projects.

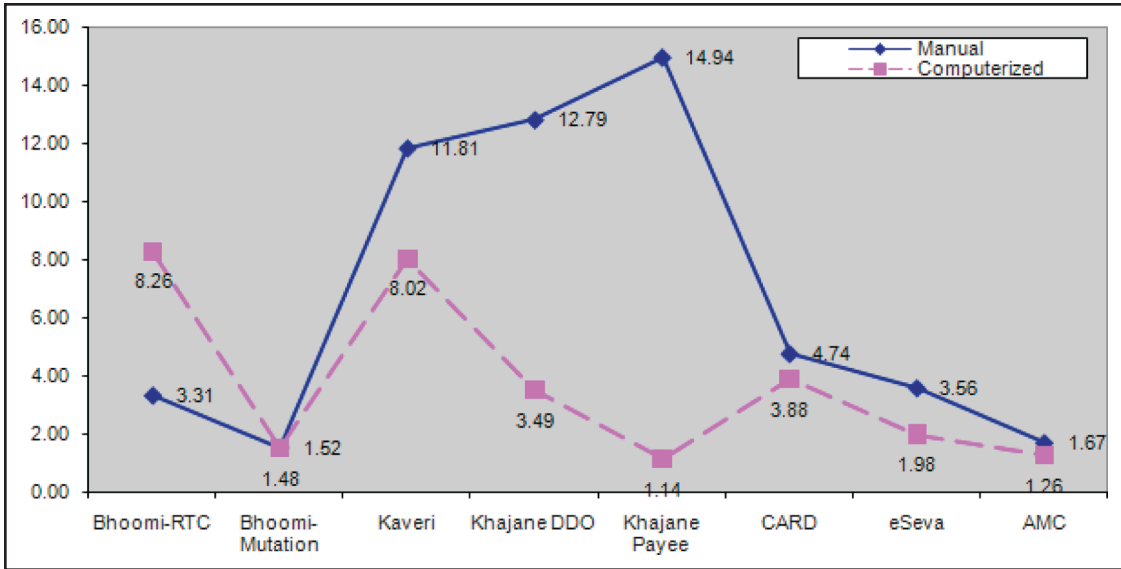


Figure 4. Error Rate (in percentage).

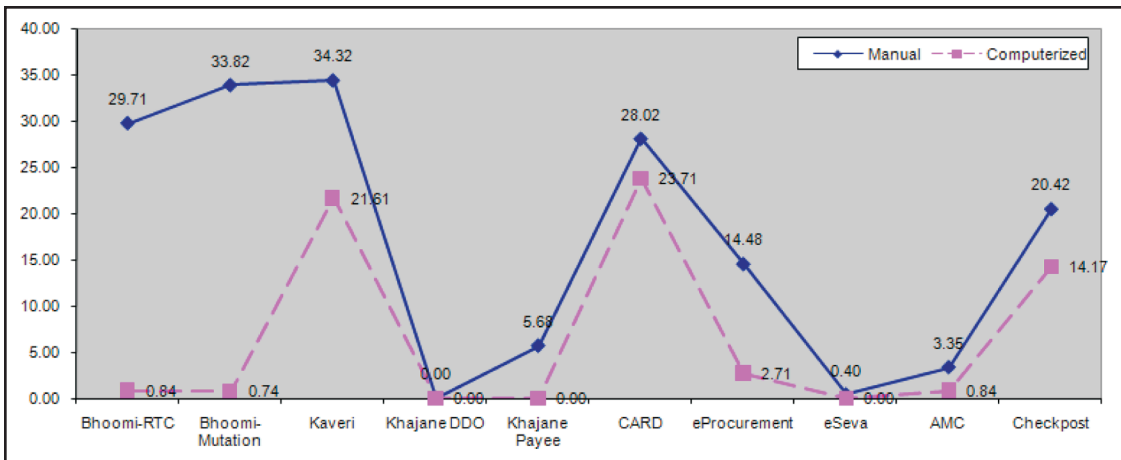


Figure 5. Proportion Paying Bribes (percentage).

cost of accessing services were measured directly. Respondents were also asked to select the three attributes that they considered most important. An “importance score” was calculated for each attribute, depending on how many respondents picked it as being among the top three. A single composite score that factors in the “importance score” of the attribute and the average rating of a project on each attribute was calculated for each of the eight projects (see Table 4). Bhoomi, Khajane, eProcure-

ment, and eSeva were rated as very successful projects. In these projects, improvement of more than one point (on a 5-point scale) was achieved through computerization.

Table 5 lists the four highest-ranked attributes for each project in descending order of their importance score (from left to right). As shown in the table, three kinds of attributes have been selected more often than others. These attributes pertain to the following: a) transactional efficiency; b) improved

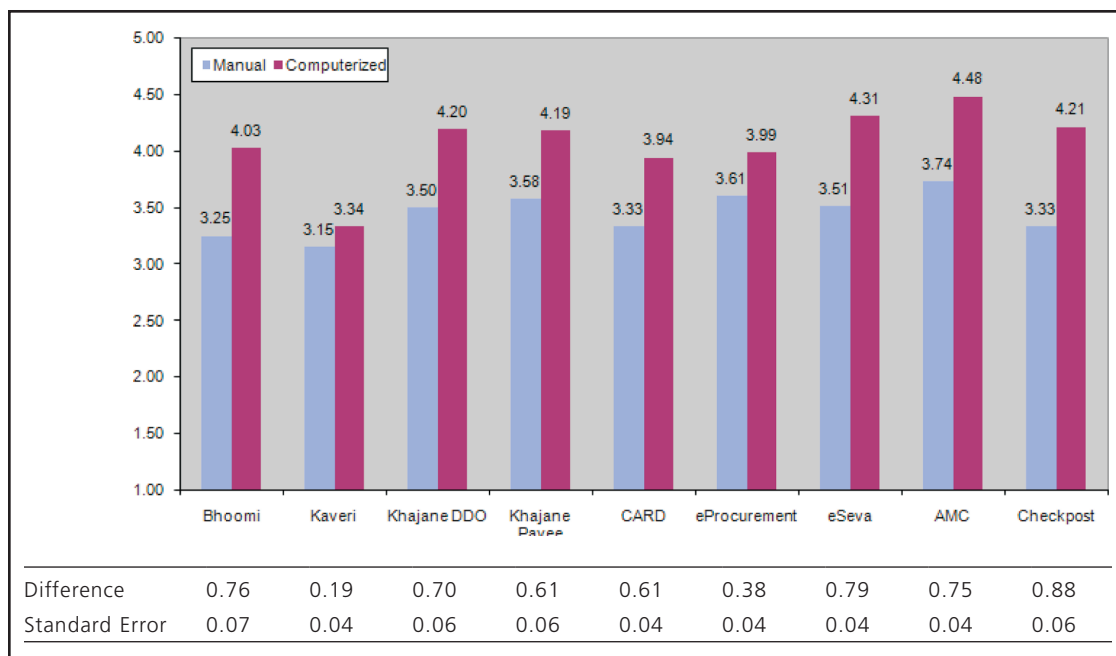


Figure 6. Overall Governance Score (5-point scale).²²

Table 3. Attributes Related to Three Key Dimensions of Client Impact.

S. No.	Attribute	S. No.	Attribute
1	Cost of availing service	2	Less waiting time
3	Less time and effort required	4	Dependence on agents
5	No delay in transaction	6	Predictability of outcome
7	Level of corruption	8	Accountability of officers
9	Simplicity of procedures	10	Transparency of rules and procedures
11	Friendly attitude of staff	12	Fair treatment
13	Convenience of location of center/office	14	Convenience of working hours
15	Complaint handling mechanism	16	Confidentiality and security of data
17	Design and layout of application forms	18	Durability and legibility of certificates
19	Service area facilities	20	Queuing system
21	Error-free transaction		

governance, including corruption; and c) quality as measured by error rate and convenience. One obvious conclusion from this analysis is that important attributes are different for different projects. If such an exercise were to be done before designing an

application, it would provide useful insights into benefits that need to be targeted and the kind of process reform that may be required. Yet at present, it is rarely done in practice, either before or after project implementation.

22. A paired *t*-test was used to assess whether the difference between the overall governance scores in the computerized and manual systems was significantly different. Test results indicate that the differences were significant at the 99% confidence interval in all projects.

Table 4. Composite Scores (5-point scale) and Preference for Computerization (percentage).

Project	Composite Score (5-point scale)			Preference for Computerization (%)
	Manual	Computerized	Difference	
Bhoomi	2.86	4.46	1.60	79.34
KAVERI	3.35	3.90	0.55	98.31
Khajane—DDO	3.24	4.43	1.19	N.A.
Khajane—Payee	3.08	4.19	1.10	N.A.
CARD	3.78	3.93	0.15	96.98
eProcurement	3.22	4.26	1.04	83.71
eSeva	3.39	4.66	1.27	96.84
AMC	3.37	4.12	0.75	97.49
Checkpost	3.48	4.32	0.84	91.25

5. Results of Impact on Agencies

It was intended that data on transaction volumes, operating costs, investments, tax collected, and revenues from transaction fees would be collected relating to the three years prior to the introduction of computerized systems, and for the entire period since computerization. However, it was very difficult to collect accurate data for pre-computerization, as often agencies did not have an MIS that was reporting such data.

By and large, the major cost component was manpower. The study revealed that staff numbers were not reduced in any project after computerization. In some projects, workload was reduced, and therefore, additional time could be devoted to other tasks. For example, in KAVERI and CARD, manual search of property data has been replaced by a database search, and manual copying of legal deeds has been replaced by scanning and digital storage, reducing the workload of employees considerably. In fact, in KAVERI, the task of scanning has been outsourced, further reducing the workload. Employees can now be assigned to collect market intelligence to fix tax rates and do physical inspection of property. Agencies are able to cope with growth in transaction volumes and reduce the average transaction processing cost. For example, in the case of CARD, transactions and revenues grew by 50% in two years from 2002–03, but the cost increased by only 6% in the same period (World Bank, 2007, p. 81).

In the case of eProcurement, government depart-

ments and agencies that used the eProcurement platform realized cost savings of an average of 20% for procurement done through the exchange during the year 2003–04, and 12% in 2004–05, due to the increased competition among suppliers (Bikshapathi et al., 2006). In addition, departments saved nearly 16.43% (US\$0.56 million annually) of their advertising costs on account of the shorter tender notices that now needed to be published in the print media. In terms of the impact on agencies, the ability to cope with growth in transactions was enhanced in all cases. In some cases, computerization helped in the growth of transactions.

Data on perception of the impact on workload and managerial processes was collected from operators (employees interfacing with clients) and analyzed. This data was collected at each of the delivery centers included in the sample. The staff in these agencies did not perceive that cost had been reduced. However, they felt that there was a significant positive impact on the quality of governance. Computerization was also seen to be partially responsible for improved tax collection by some agencies.

6. Key Findings and Implications

Respondents (citizens and businesses) who had used both the manual and computerized systems indicated an overwhelming preference for computerized service delivery in most projects (see table 4). The distinct preference for computerized systems by the clients of poorly rated projects seems to suggest that even small gains for the users can trigger major

Table 5. Top Four Desired Attributes of Services.

Project	Desired Attributes of Services		
Bhoomi KAVERI	<i>Error-free transaction</i> <u>Level of corruption</u>	No delay in transaction <u>Transparency of rules and pro- cedures</u>	Less waiting time <i>Error free transaction</i> Convenience of working hours Less waiting time
Khajane DDO Khajane Payee	<u>Simplicity of procedures</u> No delay in transaction	<i>Convenience of working hours</i> <i>Convenience of working hours</i>	<i>Friendly attitude of staff</i> <i>Convenience of location of cen- ter/office</i> <i>Error-free transaction</i> <i>Error-free transaction</i>
CARD	Less time and effort re- quired	Less waiting time	<i>Fair treatment</i>
eProcurement eSeva	<u>Level of corruption</u> Less time and effort re- quired	<i>Easy access</i> Less waiting time	<i>No need to visit government office</i> <i>Fair treatment</i> <i>Convenience of working hours</i> <i>Fair treatment</i>
AMC	Less time and effort re- quired	<u>Level of corruption</u>	<i>Complaint handling mechanism</i>
Checkpoint	No delay in transaction	<i>Error free receipt</i>	<i>Queuing system</i>

Note: *Bold*—*Transactional Efficiency*; *Underlined*—*Improved Governance*; *Italics*—*Quality*.

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positive change in perception of service delivery systems. This is a strong message for the political executive to support the implementation of e-government. The results indicated that there were no job losses associated with implementation of e-government projects—something of which politicians in developing countries are particularly wary.

Preference for the computerized system is backed by specific areas where clients have accrued concrete benefits. In most cases, the cost of accessing services was reduced because the number of trips that were needed to be made to the concerned offices saw a significant reduction, and the waiting time came down by nearly 50%. Corruption was significantly reduced or eliminated in five projects. Quality of service delivery and quality of governance were also perceived to have improved significantly with computerization in most cases. Many developing countries recognize the importance of improving governance for attaining higher economic growth and attracting direct investments. E-government has the potential for lowering bribery, provided that the necessary process reforms are undertaken. Results from the Bhoomi project indicate that simple reforms such as a first-in-first-out discipline implemented through work flow and a focus on transparency can reduce bribery significantly.

However, a significant challenge in terms of resistance from vested interests could be encountered. For example, in the case of Bhoomi, 79% of respondents preferred the computerized system, whereas, in most other projects, the figure is 95–99%. A profiling²³ of those who preferred the manual system revealed that higher-income farmers with large holdings in urban areas preferred it to the computerized system. Perhaps such farmers were able to manipulate the flexibility in the system to their advantage—something that needs to be further investigated. They were also able to use their influence to put out negative media reports about Bhoomi (Bhatnagar & Chawla, 2007).

There are also other challenges to be overcome in harnessing the full potential of e-government. There is considerable variability in the composite scores across the eight projects. The scores range from a 0.15 point difference, which represents virtu-

ally no improvement, to 1.6 (on a five-point scale), which is significant. Other studies have shown a similar variation for computerized delivery of the same service implemented across different states (Indian Institute of Management, Ahmedabad, 2008). For example, for a project for issue of RTC in 10 states, the number of trips after computerization varied from one to three, and the percentage of transactions done with bribes varied from 2–90%. The wide variability seems to suggest that projects are not following any best practices. There is considerable scope for improving the process of conceptualization and design.

The results of the assessment provide a way to evaluate the potential of public-private partnerships in e-government. Incremental operating costs for agencies (including amortized investment) per transaction could be compared with the reduction in direct cost of accessing the service reported by the clients. This would indicate the level of user fee that could be charged (which should be less than the monetized gain to the user), as well as the degree to which the project could be made economically viable. The fact that many projects can become self-sustaining through revenues from user fees indicates that private-sector investment can be tapped. Five of the eight projects have private partners, and the expansion of the sixth project in rural areas is being planned through private partnership.

Further analysis of the data indicated significant variability of impact across delivery centers in a given project. This variability should be a cause for concern for delivery models in which physical service centers are created. Part of this variability is explained by poor infrastructure (power and connectivity), particularly in rural areas. Also, given the large variation in activity levels at different centers, it is often difficult to match the capacity to the demand at each of these centers. Portal-based delivery accessed via the Internet can be a solution. However, unequal access to the Internet can put some users at a disadvantage in such systems.

In summary, then, we find that the current framework can have implications at all stages of the e-government project lifecycle. The experience of assessing the impact of the eight e-government pro-

23. An interaction tree was constructed by considering preference for the computerized/manual system as a dependent variable. The independent variables comprised those that are indicative of the user's profile, viz. occupation, income, and urban/rural status.

jects reported above and nearly four dozen other e-government projects assessed since 2006 suggests that an impact assessment exercise can help in identifying which projects are successful in terms of impact and therefore need to be replicated in other locations. Key design attributes that lead to success can be identified and incorporated into other projects.²⁴ This collected experience has also provided guidance on implementation practice, suggesting that baseline surveys should be conducted prior to implementing projects so that locally relevant, concrete improvements can be targeted. And the framework itself, alongside its obvious recommendation that impact evaluation should be built into e-government projects, offers guidance on both what to evaluate, and how to evaluate it. Finally, it provides the basis for a more cross-cutting approach; for example, it could help to establish impact benchmarking that could be used between projects, and as benchmarks for performance of future projects.

7. Limitations of the Study and Areas for Further Research

The study was exploratory in nature and undertaken with limited resources. The study used a sample size that was considered relatively small (and barely adequate) at the stage of planning the fieldwork. While the difference between manual and computerized systems on all the performance indicators was found to be statistically significant (in most cases, at a confidence level of 99%), the accuracy of the actual estimate of the difference in direct costs could be improved by the use of larger samples. The conclusions about impact on the implementing agencies are also not as robust as those for impact on citizens, because time series data on different types of costs and revenue streams related to the service being investigated could not be collected for sufficient time periods for most of the projects.

The establishment of an acceptable counterfactual was a challenge for the study team. All the projects had discontinued manual delivery of service, having mandated the use of the computerized systems for the citizens. For the assessment of manual systems, respondents needed to rely on memory. In

case of systems that have been operational for a large number of years, such recall can be prone to error. There had been no benchmarking of the service delivery in a manual system prior to implementing a new computerized system—something that needs to be done for new projects that are taken up in the future. Other forms of counterfactuals, such as a user group from an adjoining state, could be used to avoid the problem of recall (though that may introduce other biases).

The study assessed direct economic impact in terms of the cost of accessing the service. It did not measure the impact on the inherent value of efficient delivery of the service for the client. For example, copy of a land title is required for obtaining a farm loan, getting bail in a court case, insuring crops, and for purposes of checking the veracity of the record. A farmer would attach different values to efficient delivery of land title depending on the purpose for which it was required. Further work will need to be done to develop methodologies to measure such broader impacts. ■

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24. A number of workshops were organized to discuss the results of this study, as well as subsequent studies. Many explanations of why impact was positive or negative were provided by project implementers who were present in these workshops. Ideas about more integrated projects involving two to three government agencies were formulated (Bhatnagar, 2008).

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