Application of Analytics in E-Governance-a next level

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ABSTRACT

Analytics is a field of study that deals with analyzing historical data, drawing inferences therefrom, and using the information so gathered in predicting the future. Operations research, statistics and probability are used extensively for the purpose. Analytics closely resembles statistical analysis and data mining, but tends to be based on physics modeling involving extensive computation. The use of predictive analytics in government is presently less common, but it can add significant value by automating decisions in government agencies. This paper discusses the role of Analytics in facilitating effective governance and taking e-governance to the next level, using decision support systems.

Keywords: Analytics, Exploration, Segmentation, Scoring, Underwriting, Text Mining

1. Introduction

The areas of decision management, business rules or predictive analytics are most commonly associated with enhancing the value of businesses; however, government agencies can also derive significant benefits from the field of analytics. Many government agencies are adopting business rules for compliance and eligibility systems while predictive analytics and broader decision management are also becoming popular. Predictive analytics is an area of statistical analysis that deals with extracting information from data and using it to predict future trends and behavior patterns. The core of predictive analytics relies on capturing relationships between explanatory variables and the predicted variables from past occurrences, and exploiting it to predict future outcomes. Predictive analytics encompass a variety of techniques from statistics and data mining that process current and historical data in order to make "predictions" about future events. Such predictions rarely take the form of absolute statements, and are more likely to be expressed as values that correspond to the odds of a particular event or behavior taking place in the future.

Most of analytics is backward looking - in an attempt to understand what has happened, and therefore be equipped to make better decisions in the future. Alternatively, analytics can focus explicitly on predicting future performance or, in the a few cases, providing real-time information to support decisions. A concept of "exploration vs. control" highlights the difference between analysis and reporting. Analysis is about digging deep into data to discover relationships, find causation, and describe phenomena. Reporting, in contrast, is used to track performance and identify variation from goals.

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2. Critical Issues of e-governance in India

The history of successful countries like the UK or the US reveals hundreds of years of institution building, through which incentives were refined, leading to well-functioning institutions. This involved the slow political process of building human systems, setting up adequate monitoring and transparency, and solving incentive problems. Systems for public administration in industrial countries often appear archaic in terms of the lack of use of computer technology. However, the incentives operating upon individuals and agencies were adequate in order to produce adequate outcomes even without utilizing computer technology. In recent years, IT implementations in industrial country governments have been taking place, motivated primarily by the need to reduce costs both for the State and for citizens interfacing with the State. In a developing country context, the picture is considerably different. The systems of public administration seen in industrial countries involve a rich interplay of information and incentives. The full environment of information and incentives is impossible to transplant into a developing country. Hence, direct imitation of industrial country institutional mechanisms can often fail. But in India, the high population level underscores the importance of e-governance, and the need for analytics arises because of prevalent corruption levels, thus paving the way to learn from mistakes (Bhatnagar, 2004), and initiate corrective action.

The time taken for obtaining a high quality solution to a puzzle in governance could be shorter as compared to the historical experience of advanced countries. Instead of spending decades in improving subtle incentives in human-based procedures, a decisive solution can be obtained in a few years. This would help India in better governance. Governments, willy-nilly, are being drawn into the adoption of governance systems, a process that has accelerated as the pressures of public expectations mount on one hand, while dissatisfactions with the current services rise on the other. E-governance is nothing but the use of the power of information technology for highlighting the key areas which need attention of managers and building a Decision Support System (DSS) for faster turn-around times to become more efficient as well as effective. It is the Internet, intranet and information super highway, with its capacity to break the barriers of time and distance, which is creating the possibility of reorganizing and networking any organization, especially government services, to make them more user-centric, transparent and efficient. The design of higher-end DSS therefore becomes important (Turban, 1995).

The basic idea behind E-governance is to make the processes open and transparent to the maximum extent possible. If the system becomes transparent, it would become easier for the Corporation to identify:

- Laggards and workhorses
- Who is responsible for a particular loss and who is a contributor to meeting the Corporation's goals
- Seats of corruption and its trends
- Areas where employees could save time for doing the higher-end analytical work, rather than wasting time in information collection.

3. Present state of e-governance in India

Kochhar and Dhanjal (2004) have, based upon their study of the present state of e-governance in India, ranked the twenty best e-governance projects in the country, on a 10 point scale, as illustrated in Table 1.

Many more projects such as these e.g. e-seva in Andhra Pradesh (Caseley, 2000) etc have been implemented in the recent years till 2007. Coupling of analytic applications with such large IT projects provides a common infrastructure atop which different units can collaborate to rapidly share lead information, adjust tactics and objectives, and optimize performance across different levels of governance.

Table 1: Best e-governance projects

Rank	Project	Score
1.	Aarohi (Uttaranchal)	8.9
2.	KDMC (Maharashtra)	8.7
3.	Kaver-e-com (Bangalore)	8.7
4.	Railway reservation	8.7
5.	Tamil Nilam (Tamil Nadu)	8.6
6.	Rural Delivery (Tamil Nadu)	8.6
7.	Sarita (Maharashtra)	8.3
8.	CARD (Andhra Pradesh)	8.1
9.	e-Panchayat (Andhra Pradesh)	7.9
10.	LR-MIS (Andhra Pradesh)	7.9
11.	Aarnar Sewa (Assam)	7.7
12.	CIC (Assam)	7.6
13.	Land Records (Uttaranchal)	7.2
14.	Tax Information Network	6.9
15.	TIMS (Assam)	6.8
16.	Kissan call centre	6.5
17.	Customs automation	6.4
18.	Driving licence (Delhi)	6.2
19.	Agmarket	5.6
20.	Passport (Delhi)	5.1

(Source: Kochhar & Dhanjal, 2004)

The process of building of databases of information for such projects is already under way. These basic reports limit the amount of information and understanding available with specific programs. There is a provision to dig deeper into their data and discover information to help them implement their programs more effectively. Many agencies still distribute voluminous reports and spreadsheets based primarily on averages. These basic reports limit the amount of information and understanding available with specific programs. Areas where analytics is commonly employed are listed in Table 2.

3. Theoretical Framework

Models are data-hungry creatures. The more data available for the modeling project, and the more types of data brought in, the more powerful the models will be. Good data collection and storage are the best preparation for any custom modeling project (Agresti, 2002). To develop a model, analysts study how accounts from a certain performance period (often one year's worth of accounts entering collections) performed after they entered collections. The critical data is the data available at the decision point – the point just prior to the performance period. This represents the point at which the decision about how to treat an account will be made – a model can only analyze the data that is available at that point. One aspect of model development that is worth noting, because it has implications for deployment, is characteristic generation. A "characteristic" is one of the pieces of data analyzed by the model, and many characteristics are summaries or calculations based on multiple pieces of data. Analysts generate characteristics from the raw data supplied, and the algorithms they develop to generate characteristics will have to be programmed into the system deploying the model. Optimization, of course, requires even more trust and organizational change management than the transition to predictive modeling. The adoption of analytics requires serious changes in the way departments work cases, and can be perceived as removing control from "the experts" or as a way to reduce the size of collections departments. The truth is that in the battle to squeeze better results from budgets and staff counts that are at best steady state, analytics represent a very smart investment. With new innovations both in decision management software and in the analytics themselves, departments that begin investing in analytics will find the rewards continue to grow.

Table 2: Current applications of analytics to e-governance

Area of use	Application	Role of analytics
Public safety	Crime incident analysis	understanding which type of crimes are committed and where they occur
	Court sentencing analysis	ensuring that all cases are processed efficiently through the court system
	Probation analysis	Tracking the effectiveness of probation programs
	Tracking recidivism rates	discovering what causes offenders to re-commit crimes
Education	School district planning	Identifying and planning districts that ensure fair and efficient education
	Student tracking	discovering which factors contribute to student success
	Administration	Meeting mandated program and testing standards
Revenue	Property taxation assessment	ensuring that assessments are accurate and equitable
	Delinquency analysis	Identifying possible delinquents towards loan repayments
	Fraud analysis	profiling those who have the greater propensity to commit fraud
Health and social sciences	Disease tracking	tracking and report the occurrences of diseases
	Epidemiology	identifying the causes, the distribution and control of diseases
	Utilization of medical aid facilities	developing detailed profiles of those who most frequently need medical aid services
	Disease prevention	identifying populations at risk and in need of intervention
Labor	Labor force analysis	understanding the structure of the labor force
	Insurance claims	developing profiles of claimants
Environment	Eco-system analysis	understanding which factors contribute to a healthy eco-system
	Water/Air quality testing	ensuring that water or air quality meet pre-determined standards
Transportation	Route planning	planning of the most effective routes for better traffic flow
	Accident reporting	understanding which factors contribute to accidents
	Road maintenance modeling	predicting when roads will need repair
	Program evaluation and strategic planning	Statistics are also a crucial part of program evaluation and strategic planning, both of which apply to several of the categories above. For example, case management is used in public safety as well as health and social sciences.
Program evaluation	Client satisfaction analysis	Assessing extent of success in meeting public needs
	Program evaluation	understanding factors that make a successful program
	Client profiling	Developing client profiles for targeting programs effectively
	Cost benefit analysis	understanding which programs are the most cost effective
	Outcome analysis	assessing client improvement
Strategic planning	Econometric forecasting and analysis	understanding how economic patterns affect businesses
	Employee satisfaction	discovering employee attitudes
	Resource planning	ensuring that the necessary resources have correctly been identified
	Total quality management/Business process reengineering	ensuring agency efficiency

Analytics Modeling Framework starts with

- Exploration- This can be done in two ways

a. Targeted Analysis
Root Cause Analysis
Process Measurement
Hypothesis Driven
Surveys

b. Top-Down Analysis
Data Mining
Dimension Analysis
Regression
Text Mining

Sometimes, the methods of Modeling or Forecasting and Scenario Analysis or Simulations are used.

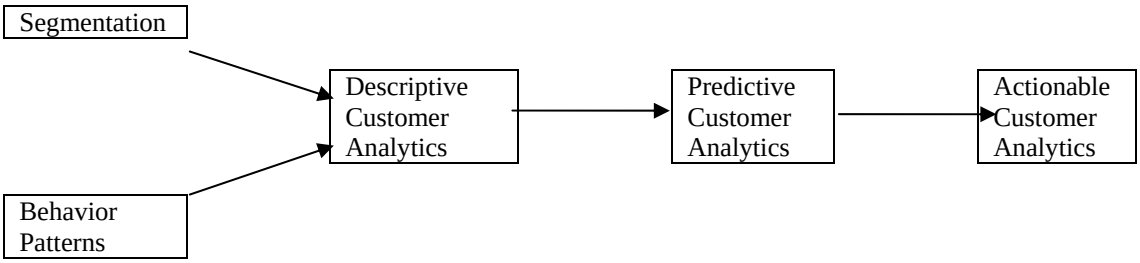

Figure1: Forecasting and Scenario Analysis

For these Performance Projections or Models, commonly used among which is 'Scoring for Operational Actions', the output may be in the form of Diagnostics, Fraud Detection and Alerts or Warnings.

4. Using analytics for better governance

E- tendering

This is a specific discipline or activity that may be viewed as a collection of technologies supporting a wide range of sourcing and purchasing options. These include buying from online web stores, conducting tenders and sales through e-auctions or e-marketplaces or to using electronic purchasing cards. This can be taken a step further by using decision support systems and analytics. Evaluation can be performed to some extent without human intervention based on past history of the type of project as well as the past history of contractors. This will link the transactions back into their core financial applications to estimate.

Underwriting

Many businesses have to account for risk exposure due to their different services and determine the cost needed to cover the risk. For example, auto insurance providers need to accurately determine the amount of premium to charge to cover each automobile and driver. A financial company needs to assess a borrower's potential and ability to pay before granting a loan. For a health insurance provider, predictive analytics can analyze a few years of past medical claims data, as well as lab, pharmacy and other records where available, to predict how expensive an enrollee is likely to be in the future. Predictive analytics can help underwriting of these quantities by predicting the chances of illness, default, bankruptcy, etc. Predictive analytics can streamline the process of customer acquisition, by predicting the future risk behavior of a customer using application level data. Proper predictive analytics can lead to proper pricing decisions, which can help mitigate future risk of default.

Collection analytics

Every portfolio has a set of delinquent customers who do not make their payments on time. The financial institution has to undertake collection activities on these customers to recover the amounts due. A lot of collection resources are wasted on customers who are difficult or impossible to recover. Predictive analytics can help optimize the allocation of collection resources by identifying the most effective collection agencies, contact strategies, legal actions and other strategies to each customer, thus significantly increasing recovery at the same time reducing collection costs.

Fraud detection

Fraud is a big problem and is of various types. Inaccurate credit applications, fraudulent transactions, identity thefts and false claims are some examples of this problem. Suppliers and even services providers i.e. basically any supply-chain network in the government system. This is an area where a predictive model

is often used to help weed out the "bads" and reduce exposure to fraud.

Portfolio, product or economy level prediction

Often the focus of analysis is not the consumer but the product, portfolio, firm, industry or even the economy. For example a retailer might be interested in predicting store level demand for inventory management purposes. Or the Government might be interested in predicting the unemployment rate for the next year. These types of problems can be addressed by predictive analytics using Time Series techniques or more effectively by analytics.

Insider trading

The second area where tracking identity matters is that of enforcing against inside trading. Internationally, every time there is a major announcement and large price movements for a stock, it is normal for the regulator to look back at recent days and ask:

- Did the stock price move before the news became public? If price movements are visible before announcement date, then there is an attempt at locating the insiders involved.
- Analytics coupled with good Decision Support Systems can be used to continuously monitor such people who resort to insider trading on a long term basis (Davies, Coggeshall, Jones and Schutzer, 1995).

Credit bureaus

Credit bureaus are institutional arrangements to share borrower credit information amongst potential lenders. In a credit bureau, the track-record of individuals and firms, when it comes to defaulting on debt obligations, is tracked in a central database. This information is available to potential lenders and to the bond market, when they make judgments about future debt transactions. Access to credit scores reduces the discretion in the hands of employees of finance companies who make decisions on consumer credit and eases the development of large finance companies. Such tracking greatly changes the incentives of individuals and firms to reduce the incidence of default. It also helps identify "chronic defaulters" and block their credit market access. This database, called "the negative list project", has information about over 350,000 defaulting individuals. Other databases about delinquent cardholders have also come about.

One project aimed at creating a nationwide credit bureau, the Credit Information Bureau of India (CIBIL), is under implementation. Once the initial framework of CIBIL has been proven, the credit information industry will grow in the direction of information providers such as trade creditors and finance companies. To begin with, only black information could be shared outside the network of banks, but this could be enhanced over time. A major problem faced in this field is the lack of a unique identifier for each individual. This would make possible the aggregation of credit information about an individual that emanates from multiple sources. It will be an important step forward when all citizens, right from birth, obtain an identification number that can serve to track credit history, pension benefits, wealth, tax liabilities, etc.

Tax administration

Tax administration is a crucial transaction-intensive discretionary public service, which has presented major difficulties in India. One of the most important recent success stories of large IT systems comes from the area of tax administration. A significant part of direct taxes is collected at the source of income, by mandating that parties paying for specified services have to deduct tax at source (TDS), and deposit the same through a select list of banks branches. Currently this forms as much as 40% of the total direct tax collected. The Income Tax Department (ITD) traditionally monitored TDS by mandating deductors to file a consolidated return giving deductee wise details along with bank payment "challan" as proof of payment. The deductees claim credit for the TDS in their tax computation with TDS certificates provided by the

deductor as supporting evidence. CBDT embarked on the establishment of a system named Tax Information Network (TIN). This network was envisaged to integrate primary information of tax payments made in designated banks, tax deduction at source and information on high value transactions.

By providing more precise, actionable information on cases, analytics can help tax collectors reclaim much more money at the same resource levels. In tax collection today, analytics face the same burden of proof they faced some 30 years ago in credit risk. While many experts cite the advantages of predictive models, and some more sophisticated tax departments have deployed them, many tax collectors still doubt that models will actually tell them much more than they can deduce by reviewing the balance or the previous activity on a case in collections.

Of course, analytics transformed credit risk management, and today every lender relies on analytics to make decisions on virtually every kind of account activity. The same potential exists in tax collection. By providing more precise, actionable information on cases, analytics can help tax collectors reclaim much more money at the same resource levels. Indeed, tax collection is primed for analytics in a way that few industries have been. As departments overhaul their legacy systems, they are installing far more advanced software systems than those used at many of the largest credit institutions. Rapid advances in collections technology, workflow and decision management software have created the ideal infrastructure for models that improve the way cases are worked.

How Analytics Improve Collections

Predictive models for tax collection identify which cases have the highest payment potential. The model gives each case a "score" that is used to determine which cases should be prioritized for collections, how aggressively to work them and even which collectors should work which cases. The advantage of predictive models is that they are able to empirically analyze all the available data, including the relationships between data elements. Each data element is weighted based on its proven relationship to future case performance. This is more analysis than the human brain can perform: Even the most experienced tax collectors rely on an only intuitive understanding of which pieces of data indicate greater "collectibility." Empirical analysis of a large number of data elements consistently outperforms human interpretation of a few data elements. Using models to select cases for collections treatment can produce big gains in revenue and a significant ROI. Results vary greatly, but it is not uncommon to see revenue improvements in the 10 to 30 percent range.

Building a Scoring Model

A scoring system for tax collection will include models for each tax type (individual income tax, transaction privilege tax/sales tax, withholding tax and corporate income tax). Often these models will reside on different systems; in any event, different data will enter the picture and have different weights for each tax type. Tax collection efforts will usually require custom models. Departments that do not have sufficient data for a full custom project may be able to utilize commercially available credit bureau risk scores which can add information to early-stage collections about the individual's pattern of debt repayment. Collections being a highly dynamic operation, are sensitive to changes in the economy, in the makeup and organization of the collections department and in tax law. The best results come from using dynamic modeling technologies developed specifically for collections. Dynamic modeling technologies have only entered the commercial arena in the last couple of years, but hold great promise when combined with emerging strategy optimization analytics, as described below.

Predictive models are highly effective at segmenting cases and prioritizing them for treatment, but they do not tell users what actions to take. The next wave in collections analytics – optimization – fills in the gaps. Optimization extends analytics into the area of treatment strategy design (Montgomery Research, 2005). In

optimization, algorithms determine the most successful action for each case, based on its precise circumstances and history. Algorithms known as decision models map the relationship between actions, responses and results. The most sophisticated optimization methodologies enable the user not only to set the desired results, but to set real-life constraints on results, such as the number of collectors, collection costs or roll rate (early stage to late stage). For departments already reaping the benefits of analytics and rules management, optimization offers another layer of revenue and process improvement.

Strengthening EPFO

Since income tax payments from all companies flow through TIN, it is easy to additionally have EPFO pension contributions flow from companies to EPFO through the identical TIN processes. This would sharply reduce the incidence of fraud associated with the mandatory pension programs run by EPFO-targeted subsidies, food stamps, voucher programs, and the bulk of public expenditures. Audit resources can also be more carefully deployed if predictive models of who is likely to have misstated their tax are used as well as more random methods. The potential return on this kind of analysis is great as most agencies do not have the resources to target all scofflaws. Clearly there are privacy and fairness issues but well designed models allow these to be addressed.

On subsidy programs in India*:*

At present, fail to reach the poor. It is possible to use IT to help improve delivery. This can be done by giving each BPL household a smart card, which can be used as an "electronic purse" holding food stamps, education vouchers, and similar transfers. Resources can be delivered into individual smartcards across the country, directly from the Ministry of Finance, without requiring an intervening bureaucracy. Resources in such smartcards can be configured for use only in specified areas, such as food or education. This will require corresponding modernization of the retailing industry. Such systems are already in use elsewhere in the world, under names such as "Electronic Benefit Transfers (EBTs)"

Such an approach to delivering minimum purchasing power to the poor, focused on fundamental needs such as water and education, would make it possible to remove the distortionary cross-subsidies in these sectors, and shift to rational frameworks of pricing and mechanisms for service delivery. Using Analytics fraud in such cases can be detected and they would enable decisive improvements in the production of public goods.

Trade Shows and Agri Product marketing–Marketing Analytics:

Closed-Loop Analytics can be used effectively compared to traditional lead tracking

Closed-Loop Analytics
• Real-time lead status updates
• Intelligent lead assignment
• Cross-functional, collaborative business processes
• Consistent and measured sales success

Traditional Lead Tracking
• Manual spreadsheet reports
• Batch oriented lead distribution
• Point-to-point processes siloed within functional boundaries
• Unpredictable sales velocity

Marketing analytic applications are built to address those challenges. They fortify the generic query and reporting capabilities of conventional business intelligence (BI) tools with marketing-specific functionality (Davenport, Cohen and Jacobson, 2007).

Because they integrate with disparate systems, these applications can leverage information from across the enterprise to help devise, track, and analyze campaigns in both B2C and B2B arenas. Rich, interactive analytics enable managers to realize insights into performance and lead generation that are not possible with transactional marketing systems. Let's take a look at some of the key areas they address. Tracking and

analyzing campaign performance is a crucial first step in generating quality leads on which a sales organization can execute. A good marketing campaign analytic application takes aim at the issue with prebuilt metrics and analytics that make it easy to answer such questions as:

- New customer acquisition rates by campaign
- Response rates by channel, geographies, demographics
- Best-to-worst rankings of multiple campaigns
- Cross-sell/up-sell success ratios
- Frequency, retention, and reactivation rates
- Improve Lead Quality Through Segmentation

Analytic applications enable managers to crystallize crucial distinctions among prospects and improve lead quality. Once information is provided, you can segment and rank Prospects by job position and unit, purchasing authority and patterns, products used, vertical industry and more. Analytics uses unique set-based technology to sort through large volumes of information to help:

- Categorize prospects by purchase patterns, profitability, lifetime value
- Forecast cross-sell and up-sell potential
- Segment leads based on quantity/quality of profile information
- Group customer response rates by channel
- Determine characteristics of high/low responders

The same analysis is useful for governments in assessing compliance levels as also the effectiveness of the services provided under their various programs. Governing bodies and their oversight committees need information to make decisions on programs they oversee. This information, which reveals whether a program is working and if it is effective, often falls into three very general categories: descriptive, implementation and effect. Descriptive information provides information on programs and their objectives. Information about implementation covers procedural issues, and outlines how the program is carried out. In the past, "implementation" information addressed requirement and procedure compliance – not program outcomes. But today, program funding is tied more directly to quantitative program goals and measurable effects. So analytics may sometimes be more useful to find whether a particular program is running effectively or not.

Law and Order-Robust Data Mining Coupled with Analytics

Use of predictive analytics in government agencies can generate ROI as well as increased agility and reduce ongoing costs while providing better service to citizens. Analytics can help them use scarce resources more effectively. Use of analytics in transportation leads to more accurate traffic forecasting as also improved transportation planning. Analyzing and predicting traffic flows and growth is a complex process in populated countries like India, but can lead to significant benefits, including decongestion of roads and motorways. For the purpose, data has initially to be obtained from existing databases or records. This data, obtained from a detailed transport survey, has to undergo complete extensive pre-processing before it is amenable to data mining. Analysts can then select a representative variable for each group of fields, and ensure that the groups are independent of their effect on transport mode. This process, involving analytics in the form of neural networks, leads to the prediction of a three-way variable—whether someone would walk, drive, or take public transportation for a specific journey.

An equally important application of analytics is its use to support public safety and security efforts. Public safety agencies not only can access data from multiple databases, they can also integrate textual data such as field reports, phone records and transcripts, web page content, and e-mails—in multiple languages—into their predictive analysis. This enables analysts to detect patterns that suggest likely security threats or criminal activity, and relay this information to the field, so that staff can be deployed appropriately and kept

informed of current conditions. These models analyze the tens of thousands of alerts that agencies receive each day. By differentiating between false and legitimate alarms, the software enables analysts to focus attention on activity that is more likely to pose a real threat to computer and communications systems. Web analytics play a major role in this mode of application.

Analytics can also find use in predicting terrorist activities and public health security, which is a major concern for any country. The major example of bioterrorism is Sars and the use of nerve gas Sarin by terrorists in Japan. Analysts review and analyze crime data, identify trends and patterns, and develop predictive models. Models are then made available to operational personnel through an intranet, enabling command staff to evaluate real-time conditions and send units where and when they are most likely to be needed. For example, analysts could create and maintain a database holding information on drug offenders. This database helps the department monitor the current drug situation.

5. Concluding Remarks

The main argument of this paper is that in many situations, difficult puzzles of governance can be solved in dramatically new ways using Analytics. Nationwide centralized databases, coupled with ubiquitous high-speed Internet access, and pervasive computational power, has put a new set of solutions within reach in India. The most difficult puzzles of governance are those of building human-intensive public services which are transaction intensive and discretionary. The arguments of this paper suggest that in a certain class of situations, discretion can be reduced, and transparency can be improved, thus easing the principal-agent problems that afflict public administration. In addition, two other avenues through which IT systems are influential are reduction of per-transaction cost and as opportunities for improving the extent of contracting-out. For these situations, IT-intensive designs offer dramatically superior solutions to problems of governance. Sometimes, difficult problems which require labor intensive monitoring – such as the conduct of individuals in a financial market – are simply eliminated by a computerized solution. Sometimes, a computerized solution – such as the railway reservation system – brings in new kinds of transparency which eliminates discretion.

India now has extensive experience with these kinds of systems. The engineering and management capacity required for conceiving, designing, building and operating these systems is now available. The underlying pre-requisites, such as ubiquitous nationwide Internet access or digital key infrastructure, are now in place. Hence, there is a need to go the next level i.e. Analytics. The time taken for India to go from a primitive state to the frontiers can be compressed into a few years. This contrasts sharply with the multi-decade process which was required, in the historical experience of today's advanced countries, in creating adequate checks and balances, transparency and incentives, which have induced an adequate supply of public goods of the requisite quantity and quality. This paper has sought to show a series of large, nationwide IT systems which have been successfully implemented in India in recent years, and thus argue that today, the management capacity does exist in India to design and build these systems.

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