URBAN DEVELOPMENT DEPARTMENT

3.3 Information Technology systems of Bangalore Water Supply and Sewerage Board

Highlights

The Bangalore Water Supply and Sewerage Board (Board) is responsible for providing water supply and sewerage system and sewerage disposal in Bangalore Metropolitan Area. The Board had undertaken several initiatives to use information and communication technologies to improve the quality of services to citizens. However, the initiatives were not backed up by building in appropriate Information Technology (IT) controls for planning, implementation and maintenance of data and other IT assets leading to sub-optimal realisation of the objectives of computerisation.

Lack of sufficient monitoring and failure to work out appropriate logistics for implementation of Geographical Information System project resulted in expenditure of Rs.10.06 crore remaining unfruitful.

(Paragraph 3.3.5)

The revenue billing package did not support reconciliation of collections between the system and the bankers of the Board, leaving an amount of Rs.121 crore unreconciled.

(Paragraph 3.3.6.1)

Absence of well documented User Requirement Specifications resulted in non-provision of critical controls and security in the billing system.

(Paragraph 3.3.6)

Poor development and maintenance of the website resulted in improper presentation of the board's profile to the internet users.

(Paragraph 3.3.7)

Lack of strategic IT Plan resulted in non-realisation of optimum benefits of computerisation.

(Paragraph 3.3.4)

Limited benefit to consumers was available despite huge expenditure of Rs.4.11 crore on round the clock receipt of water charges.

(Paragraph 3.3.8)

Local Area Network and Wide Area Network facilities set up at a cost of Rs.1.33 crore remained under-utilised due to poor planning and implementation.

(Paragraph 3.3.9)

Inadequate security arrangements exposed the system to risk of damage to IT assets and misuse of systems.

(Paragraph 3.3.10)

Inadequate change control procedures exposed the system to the risk of unauthorised changes.

(Paragraph 3.3.11)

Absence of well-developed business continuity plan to take care of IT assets exposed the Board to losses in case of disasters.

(Paragraph 3.3.12)

3.3.1 Introduction

Bangalore Water Supply & Sewerage Board (Board) came into existence by an Act of State Legislature in October 1964. The main function of the Board is to provide potable water supply to the citizens of Bangalore and arrange disposal of sewerage generated in the metropolitan city. The Board introduced two major IT applications for qualitative improvement in delivery of services to the citizens. The Board spent Rs.16.45 crore (March 2007) towards cost of acquisition and development of IT assets (hardware, software and facilities) for implementing computer applications. The Information Technology applications introduced by the Board are;

(i) Geographical Information System (GIS)

(ii) Bengaluru Ganakeekrutha Grahakara Seve (BGGS) – Revenue Billing System and Financial Accounting System.

GIS was implemented to digitise all details of leaks, bursts, overflows, enabling generation of reports for management decision making, remedial action to replace water supply/sanitary line and analyse the effects of Pressure of water flow *etc.*, at an estimated cost of Rs.10 crore.

Revenue Billing System handling water revenue of over Rs.300 crore annually is also supported by payment kiosks set up at a cost of Rs.4.11 crore to facilitate round the clock collection of cheque/cash from customers.

A Wide Area Network (WAN) at a cost of Rs.1.33 crore has also been set up to connect all sub divisions with the central office.

3.3.2 Audit objectives

The basic objective of the IT review was evaluation of the quality and adequacy of IT governance in place alongwith controls built in to ensure data integrity, security of data, systems and other IT assets in the computer applications – GIS and BGGS in particular and other packages in general.

3.3.3 Scope and methodology of audit

Performance audit of IT systems of the Board was undertaken by test-check of records for the period 2002-07 from October 2006 to January 2007 in the Central Office of the Board at Cauvery Bhavan, Bangalore, One Division

Office[19] and five sub-Divisions[20]. The sample data of the information contained in data tables received from the Board was scrutinised using the generalised audit software – IDEA[21].

Audit findings

3.3.4 IT Policy and strategy

Lack of strategic IT Plan resulted in sub-optimal benefits of computerisation

The computerisation effort was *ad hoc* and on piecemeal basis instead of development based on a pre-determined IT strategy dovetailed into overall business plans. The individual initiatives of computerisation were taken without any linkages to other existing and upcoming applications. No risk assessment of IT initiatives, plans and programmes was carried out. An illustrative list of observations include:

- The GIS was set up at a cost of Rs.10 crore without working out logistics of building and maintenance of a huge database.
- A Local Area Network (LAN)/Wide Area Network (WAN) interconnecting computer systems set up at a cost of Rs.1.33 crore was not dovetailed with GIS/Revenue Billing Software.
- The BGGS software was developed without centralised features like providing instantly available data relating to revenue billing and accounts at the Board level.
- The development of software for Financial Accounting and Stores commenced during February 2004. However, the package was yet to be implemented (December 2006).
- Development of web site of the Board on *ad hoc* basis resulted in time overrun and inaccuracies in web pages.

Thus, IT assets were procured on *ad hoc* basis and the Board failed to realise optimum benefits of computerisation despite investing significant amounts on IT assets.

Development and maintenance of Computer Applications

Audit noticed that no structured approach for development and implementation of various computer applications had been adopted. There was no documentation laying down critical information such as the nature and scope of each system development project. There was no procedure for making a formal economic and technical feasibility study. It was also observed that no risk analysis study was made identifying security threats, potential vulnerabilities and their impact on the implementation. User requirements were not clearly defined in development of packages. For example, in Revenue Billing System, there was no seamless integration at all levels. All types of revenue receipts were not computerised – payment kiosks were not connected to LAN; collections from agencies were populated into

[19] South Division, Jayanagar.
[20] Central-1, South-1 , South-3, South East-2, North-2.
[21] Interactive Data Extraction and Analysis

system by accessing at the back-end. Audit observations on deficiencies in development of computer applications and maintenance of database are discussed in the succeeding paragraphs:

3.3.5 Geographical Information System (GIS)

Lack of close monitoring and working out the logistics of implementation resulted in expenditure on GIS remaining unfruitful

The system was intended to deal with data regarding water supply and sewerage system of about four lakh customers. The Board entrusted the work of system study and analysis, system design, development of web based application, supply of hardware and software required for implementation of application, training and hand-holding to M/s. SCE France under the Indo-French Protocol in 1999. The project was taken up in two phases; (i) 100 square km at a cost of French Francs 78,44,153 (approximately Rs.5.49 crore) (ii) additional 190 square km at a cost of 7,62,245 Euros (approximately Rs.4.57 crore). The work was completed by M/s. SCE France and handed over to the Board during November 2002. The operation and maintenance of GIS was entrusted to M/s. GENESYS International, Bangalore at a cost of Rs.57 lakh for three years from November 2003 to November 2006.

3.3.5.1 Incomplete application

The package was delivered incomplete, lacking in the following features required under the contract:

* smart map features capable of delivering necessary GIS and other data over internet and intranet for Public Information.
* facility to gather spatial and non-spatial data regarding:
  (i) Electrical distribution network consisting underground distribution cables such as 66 KV, 11 KV cables Feeder boxes, RMUs, distribution transformers, *etc.*
  (ii) Telecom network consisting of fibre optic cables, primary and distribution cables, joint pillars and distribution points.

3.3.5.2 Input validations

The package did not have appropriate validations to prevent and detect patently incorrect input. The database depicted the year of Installation of water pipes, date of updating GIS and dates of Survey as carried out in very old periods and future dates such as year 1899 and year 7378.

Some more illustrations of discrepancies observed were as under:

Database	Discrepancy	No. of records	Remarks
Consumer	Unauthorised water connections with Unique Numbers	15	Data unreliable
	No consumer IDs allotted	18,273	Incomplete data
Area	Duplicate identity	23	Data unreliable.
Annotation	NIL Text	8	Incomplete data
Sewer	Map numbers not keyed in/keyed in the other columns	331	Lack of input validation controls
Water pipes	Map numbers not keyed in	93	Incomplete data
Hydrant	Map numbers not keyed in	17	Incomplete data

Board replied (April 2007) that multiple IDs were due to assigning the IDs by trial and error because of absence of source code. However, errors are being checked and rectified.

Inadequate input validations led to incorrect data capture and resulted in difficulties for search by address, date, RR number, *etc.,* making it unreliable for meaningful management decision-making.

3.3.5.3 Output controls

Some of the views/reports like information on valves, manholes (water/sewerages layer), selection of area (Administrative Data and Base maps), time specified analysis and interface connectivity (Mapping Menu) did not work due to errors inherent in the package. Lack of proper output controls made the application less functional and did not facilitate proper monitoring of its utilisation. This indicated inadequate controls at development, testing and acceptance stages.

Board replied (April 2007) that the errors observed have since been rectified using ARCINFO[22] software.

3.3.5.4 Incomplete creation and maintenance of database

M/s. SCE France was required under contract to create and maintain an up-to-date database containing details of water supply and sewerage systems, consumers, *etc.* Out of 290 square km of project area, base maps were yet to be obtained for 37 square km and integrated to database. Thus, there was shortfall in creation of the database initially.

An analysis of the data furnished, revealed many discrepancies as illustrated below:

- Details of Customer ID, last bill paid, *etc.*, were not found keyed in respect of data of 65,535 customers.
- Out of 15,250 consumers, in a sub division 3,550 consumers had no RR Numbers (unique IDs).
- While storage capacity for the city as indicated in the web site of the organisation was 109.94 Million Gallons, the database indicated storage capacity as high as 3,43,576 Million Gallons.
- Many junk entries were observed for the area name in the area database.

It could also be seen that many discrepancies existed even in the limited database examined by Audit. The inaccuracies and shortfalls in the system rendered the database unreliable for generation of MIS reports.

Audit observed that even though the agency entrusted with maintenance of the database had claimed that data relating to 4,35,873 consumers were updated in GIS package, data relating to 65,535 consumers only were available.

[22] Arcinfo is a software used for data building, modeling ,map display and analysis

The main objective of the GIS was to generate reports of maps for use in analysis of problems and maintenance of water supply/sewerage systems. It was, however, observed in audit that use of GIS reports for maintenance or analysis was minimal.

Audit observed in one test-checked division that the data entry of details of work like 'pipe line', 'GIS package status', 'consumer updation', *etc.,* was in arrears for periods ranging between 2 and 37 months in respect of 13 sub-divisions and where data entry was done there was delay ranging up to 56 months. As there were delays in keying the essential details, the database was incomplete and unreliable for up-to-date querying and supporting decision-making.

It was also observed that the developer did not provide passwords to operate the system at the time of handing over the project. No formal handing over report exists about the status of work, details of hardware, software, *etc.* (December 2006). Moreover, neither the officials of the Board had the expertise to operate the system nor any new agency was appointed to continue the work on the expiry of the contract with M/s. GENESYS.

Board replied (April 2007) that formal handing over had since been done by M/s. GENESYS International in April 2007.

However, the fact remained that the Board lacked expertise to utilise the package as a new agency was yet to be appointed.

3.3.5.5 Overall project management

The project management did not

- Ensure that appropriate controls and validations were built in
- Work out the logistics of building of the huge database considering
    - Getting the records on time for updating from sub-divisions.
    - Viability of tying up with the revenue billing software.
    - Willingness and aptitude of the employees.

Thus, due to incomplete and unreliable database the Board failed to achieve the intended objectives namely,

- Digitising leaks, bursts, overflows, *etc.*
- Enabling generation of reports for remedial action.
- Analyse effects of pressure of water flow.

3.3.6 Bengaluru Ganakeekrutha Grahakara Seve (BGGS) - Revenue Billing System

Prior to BGGS, a revenue billing system developed by M/s N Soft (I) was being used. In June 2002, Board decided to request National Informatics Centre (NIC) to develop new software for revenue billing system (BGGS) to overcome the snags associated with the old software. The normal procedure of selection of developer through tendering process was not followed.

User Requirement Specifications

Absence of a clearly documented URS resulted in non provision of critical controls and security in the billing system

A documented User Requirement Specification (URS) detailing essential features and to serve as a benchmark for ascertaining whether the package was developed in accordance with the objectives was not drawn up which resulted in many deficiencies as discussed in succeeding paragraphs.

3.3.6.1 Provision for reconciliation

The process of reconciliation was particularly significant as number of credits and debits were huge and from varied sources like kiosks in sub-divisions, Electronic Clearing Scheme (ECS), agency like Bangalore One, *etc.* The package did not support reconciliation of revenue collected as per system with the bank balances of the Board and cheques received at kiosks, credited to Board's account were being reconciled manually every month. However, as the process of reconciliation was complex, the reconciliation had fallen into arrears for 2 to 12 months in 11 sub-divisions, involving Rs.121 crore. Further, it was also observed that debits and credits in respect of ECS transactions and Bangalore One Agency transactions involving Rs.62 crore remained un-reconciled.

3.3.6.2 Dormant connections

Billing on the basis of consumption ceases when readings cannot be taken for various reasons like door locked, meter not accessible or damaged, *etc.* In such cases, only fixed charges were levied though water supply continued. The package did not ensure that the bills were raised in all such cases. In one sub-division, there were 1,787 cases where connections were dormant between 13 months and 36 months and in 1,078 cases beyond 36 months. In another sub-division it was observed that the bills were not issued for intervening months ranging from 3 to 34 months in respect of 16 consumers. The ineffective practice of reporting and absence of appropriate prompts by the system led to avoidable losses of water revenue of the Board.

3.3.6.3 Integration of collection agencies and Kiosks

The collections through Bangalore One, the e-governance project of Bangalore city was not seamlessly integrated to the sub-divisional database as the payment of water bills by customers through the agency was not directly populated. The database was accessed through back-end to carry out transactions relating to payment through the Bangalore One agency and ECS. Any back-end changes to critical financial data as in this case indicates a serious risk which was compounded by the absence of any compensatory controls. Similarly, not connecting the kiosks through the local area network of the sub-division involved risk of data security.

Input controls

Audit observed that input controls were deficient. A few illustrative examples are indicated below:

3.3.6.4 Lack of control over write-off option

Write-off option in the package that goes to reduce the billed amounts did not have an input control, like keying in a compulsory documentary reference, where write off was approved by a competent authority. In some instances data entry operators used write-off option, for which they were not authorised to. Write-off entries for Rs.30,083 was not supported by reference to any document. Further, records of the Internal Audit Wing of the Board indicated that write-offs worth Rs.1.48 crore were made without any reference to supporting documents exposing the Board to risk of misuse/irregular waivers.

3.3.6.5 Facility for correction of errors not provided for

The package did not provide for correcting the errors in data entry. A correction was not possible, after bills for the month were printed. Corrections in such cases were carried out by accessing the database through back-end rendering the system vulnerable to manipulation. A sub-division had to resort to write-off option for updating the customer information following crash of kiosk.

3.3.6.6 No provision for supervisory check

Data entry of water meter readings from meter reader cards is being done by temporary workers without further authorisation/confirmation by a supervisor. As a result, errors in data entry went undetected. In one sub-division, errors in data entry in four cases involving Rs.14,348 were observed. Similarly, the package did not provide for recording the manual checks done by the supervisory staff.

3.3.6.7 Capture of revenue receipts

The package did not provide for entry of various receipts other than payment towards water bills like deposit, pro-rata charges, receipts towards lorry loads *etc.* Keying in details of a new connection did not start right at the application for a new connection stage. As a result, the system generated revenue realisation statement depicted only revenue realised from water bills. The other receipts had to be manually added to arrive at the overall revenue realised.

Process Controls

The package lacked many process controls affecting the accuracy of outputs and security of data, as detailed below:

3.3.6.8 Calculation of average consumption

The consumption for the month was taken as average of previous six months where meter reading was not available due to various reasons. However, wherever Suspected Meter Stop (SMS) was reported, average consumption prior to SMS was considered. Any error in not recording such condition or not reporting sub-normal condition as 'SMS' would result in booking lower demands as can be seen from six cases, involving short booking of demand by

40,600 litres. In the absence of suitable prompt/control in the system this practice created vulnerability of meter reader/data entry operator intentionally or inadvertently to record lower consumption, which could result in computation of lower average and consequent loss of revenue.

3.3.6.9 Deficiencies in design

The head office package provided for certain reports styled 'cost recovery statements' for use by the Board. However, it contained only demand for water supply booked and cost incurred was not taken into account for its computation.

The logon audit table created to store login and logout time of users did not have provision to capture time stamp thus defeating the purpose for which it was created.

3.3.7 Development of the Website of Board

3.3.7.1 Planning and co-ordination

The website of the Board was initially designed and hosted by hiring a private firm in the year 1999. The contractor was paid for 154 pages while only 50 pages were intended to be developed. Poor planning of pages and content and ineffective coordination of the work among the different departments furnishing the requirements, resulted in an extra avoidable cost of Rs.1.30 lakh. This further required changing the design of the website often on the ground that it was outdated or not user-friendly.

3.3.7.2 Inaccurate and inconsistent web pages

Many factual errors, information stated to be provided not available, messages carrying no meaning; items under "news" containing information more than five years old and numerous spelling mistakes/ not clearly framed sentences or conveying no meaning were posted on the website. Some more illustrations are detailed as under:

Item	Intended to display	Displayed
Projects awarded under International Bidding	Awarded projects	Not awarded
Non-Domestic tariff in the highest slab	Rate for one lakh litres	Rate for 10,000 ML
Achievements option	Achievements	Merely scrolls up the screen
Online Complaints Management System	Details of payment centres	Not working

3.3.7.3 Poor maintenance

In January 2006, the Board decided to entrust the maintenance, management of the website to NIC. Since a common understanding could not be reached in respect of Annual Maintenance Contract, the website was not updated after January 2006 and the website continued to show the names of officers holding key positions who had retired from Board service.

Thus, inaccurate and inconsistent approach to development and maintenance of the website at a cost of over Rs. five lakh resulted in not getting the desired benefits of proper projection of the board's status on the World Wide Web.

The Board replied (April 2007) that action would be taken to rectify the errors.

3.3.8 Kiosks based collection

Lack of a proper cost benefit analysis considerably added to cost of service

The BGGS originally designed with a cash counter facility for collecting cash/cheques was implemented from April 2003. In January 2004, an agreement was entered with M/s. TATA INFOTECH for supplying, installing and commissioning of 75 bill payment kiosks at a total cost of Rs.4.11 crore (in two batches of 50 kiosks at Rs.5.47 lakh each and 25 kiosks at Rs.5.50 lakh each). The main objective was facilitating payment by consumers on 24 x 7 basis. No cost benefit analysis was carried out to ascertain current and future costs, whether cost of service would be affordable in view of the fact that Board was to provide the services on no-loss-no-profit basis as per Board's Act. The kiosks were not totally automated but merely collected cash/cheques from consumers. The services of the cashier were still required for counting cash, to prepare preliminary account, copy data for transfer to BGGS and handover the cash to the agent of the bank. In case of system crashes the contractor referred them un-authorisedly to another firm for recovery of data, which affected data security and entailed additional expenditure.

3.3.8.1 Maintenance of Kiosks

It was observed that there was no system to take a back up of the kiosk data between two successive transfers to servers through portable external storage devices (USB flash memory devices). Kiosks in the premises of the Board's sub-divisional/divisional offices were not brought on the respective LANs. As

such, the retrieval of data in case of crashes at kiosks would be very difficult. However, data in respect of a day's transaction of a sub-division was yet to be built up due to absence of such a back up (December 2006). The delays in restoration of faults were not monitored closely and penalties imposed for deficient service.

No complaint register had been maintained in many sub-divisions to record the date on which the kiosk went out of order and the date on which it was made functional. Only a few call reports were filed. The agreement laying down the conditions for annual maintenance and preventive maintenance was not produced to audit. It was also observed that the vendor had not supplied any operations/users manual and it was also not insisted upon by the Board. Thus maintenance of kiosks needed to be fine tuned for improved service.

3.3.8.2 Delay in remittances

The agent of the bank acknowledged the cash and cheques received from kiosks on the same day. However, the bank accounted all such remittances after a delay of three to four days indicating delay in remittance by the agent. This had to be followed up and remittances brought to the Board's account the same day. The Board replied (April 2007) that the matter will be taken up with the bank.

3.3.8.3 Security of Kiosks

Machines acquired at high prices need to be closely monitored to obtain higher efficient service

The consumers' ledgers were being updated through portable external storage devices (USB flash memory devices) which were used to copy the data from the kiosk in a text format and uploaded to the server through a client system. It was, however, observed that the data in the text format was not encrypted and hence not tamper-proof. Further, a duplicate key to cabinet housing kiosk was available with the security personnel (not being regular employees of the Board) for adjusting the printer, resetting the operating system, *etc.,* which exposed the system to risk of irregularities. The vendor had not handed over the source code to the Board. Consequently, the Board had to depend on the vendors for any modifications to the software. The kiosk accepted even fake notes as there was no mechanism for detection of fake notes. This exposed the Board to risk of losses. Thus, expensive machines acquired at a cost of over Rs.four crore have to be more closely monitored obtaining prompt service from contractors and levying penalties for delays.

3.3.9 Objectives of LAN/WAN Network not achieved

Lack of feasibility study resulted in not meeting the objectives of the LAN-WAN facility set up at a cost of Rs.1.33 crore

The Board approved in June 2002 providing LAN and WAN connecting computer systems in all divisions and sub-divisions with the head office systems at an estimated cost of Rs.1.68 crore. The work was split into two portions and tenders finalised. The first work of networking was entrusted to M/s. HCL-COMNET at an estimated cost of Rs.81.91 lakh and the second

portion being supply, installation and commissioning of hardware, software was entrusted to M/s. WIPRO at a cost of Rs.29.25 lakh. It was observed that the LAN-WAN facility was not being used as stated below:

(i) The Head office did not access accounts of all divisions on line. The accounts were compiled by divisions and sent to head office on CDs or other media even though the WAN connectivity existed;

(ii) The Engineer-in-Chief (Kaveri) did not receive daily flows from CWSS I, II, III at head office for review;

(iii) The GIS information was not obtained online;

(iv) The connectivity was not used between head office and the sub ordinate offices to facilitate officers to access the relevant data on line.

The facility set up at a cost of Rs 1.33 crore could not meet the objectives due to lack of a thorough feasibility study and carried out without reference to any overall IT plan and also rendered the facility being grossly underutilised.

Board replied (April 2007) that an action plan was drawn to set up a "Data Centre" to meet the objectives.

3.3.10 Maintenance and Security of systems, data and other IT assets

3.3.10.1 Maintenance of BGGS

There were no centralised instructions on creation of user-IDs. In one sub-division user-IDs were created for all users afresh every time there was a change of the Head of the sub-division. In another sub-division a retired manager's user-ID was active. Audit observed that data entry was carried on by temporary staff like security service personnel. Even write-off of dues was carried out by such personnel. This indicated that instructions for assigning roles were needed.

Further, there was no adequate documentation regarding break downs, downtime of IT Assets and details of preventive maintenance carried out. Problems reported, dates and time when complaints were attended were not systematically maintained and followed up by levy of penalties for delays in rectification. No operations manual was supplied by the vendor which affected systematic and smooth operation of the package. User manuals were not updated with the change in versions of software package. While software package being used was of version 3.0, manuals available were of only version 1.1.

3.3.10.2 Security of Server

Inadequate security arrangements exposed the system to risk of damage to IT assets and misuse of systems

Server room was not kept under lock and key in the test-checked sub-divisions. Computer systems were installed in the server room and printing activities were carried on. A log book for monitoring the activities of server operations, its security, problems of facilities and speed of the network, *etc.,* was not maintained or was not up to date in the sub-divisions test- checked.

There was no fire fighting equipment in/around the server rooms. No systematic record was maintained regarding periodical maintenance/on call details in respect of hardware, UPS, Printers, *etc.* Protecting the server room and other IT assets against possible physical damage or unauthorised access needed to be considered and appropriate instructions issued.

3.3.10.3 Access controls

No review of access profiles was carried out in central office as well as in divisions/sub-divisions. In some of the sub-divisions test-checked, there was no mechanism to monitor the unsuccessful log-ins by unauthorised persons. Many users were leaving the system open and there was no mechanism for automatic log off after some time which rendered the system exposed to risk of unauthorised use. No written instructions were issued regarding change of passwords periodically and structure of passwords. No segregation of duties was observed for functions like data entry, system administration, system development and maintenance, change management and security administration, no job description documents were maintained.

3.3.10.4 Data security controls

It was observed that the data, revenue billing in particular, was not classified into different classes according to security considerations and access roles defined for the different classes on a "need to know" basis. There was no system to define, implement and maintain security levels by each of the data classification identified above the level of "No Protection Required". In view of the high sensitivity and significance of the revenue billing package and GIS package, the management should provide for sufficient cross training or back up of identified key personnel to address unavailability. The management should establish succession plan for all key functions and positions. Personnel in sensitive positions should be required to take uninterrupted holidays of sufficient length to exercise the organisation's ability to cope with unavailability and to prevent and detect fraudulent activities. However, it was observed that no such provision was made.

No programme to highlight the importance of security awareness had been arranged in any of the locations test-checked. Holding of such programmes to increase security awareness could be considered to avoid possible losses due to security lapses. No procedures and guidelines were in place to ensure that employees did not use unauthorised, unlicensed personal software. Moreover, adequate preventive, detective and corrective procedures were not in place to

protect the data and systems from intrusions, from Internet and public network (by installing appropriate firewalls).

In view of the huge revenue transactions being handled by the system, security of data and IT assets needs to be reviewed and appropriate measures taken to minimise the risks involved.

3.3.11 Change management controls

Lack of Systematic change management controls could not bring out orderly documentation of changes to system

A number of changes to the BGGS software and other packages had been carried out after it was installed in the year 2003. To minimise the likelihood of disruption, unauthorised alterations and errors getting into the application package, a management system that provides for the analysis, implementation and follow-up of all changes requested, was to be in place. However, no documents had been maintained in respect of request for change, specification of change, request to move source into test environment, completion of acceptance testing, request for compilation and move into production, overall and specific security impact.

Lack of systematic change management controls exposes the system to risk of unauthorised changes in system and consequent errors and irregularities.

3.3.12 Business Continuity Planning and Disaster Recovery Management

3.3.12.1 Off-site storage of back up data

Inadequate arrangements for back up could lead to avoidable loss of data and time in case of crashes

Back up of data were being taken at the end of each day in a weekly cycle and stored in the table-draw of the clerk in the test-checked sub-divisions. No instruction for storage of back up media, its location, off-site back up *etc.,* was available either in the Central Office or sub-divisions test-checked. Further, even though back up was taken on tape cartridges no mechanism was in place to record that the back up was actually taken and periodically tested independently for retrievability. Back up procedures needed to be reviewed for safe custody of the first copy in strong room/steel cupboards, considering storage of a second copy in off-site location as also a system for a regular check of the retrievability of the back up data to guard against non-availability of back up data in case of fire, *etc.*

3.3.12.2 Inadequate emergency response procedures

There was no well developed business continuity plan to take care of IT assets in case of disasters

No business continuity and disaster recovery plans were drawn up. Moreover, no guidelines, emergency procedures, response and recovery procedure to bring business back after a disaster, co-ordination procedure with public authorities, customers, and media were in place to retain source documents so

that data was reproducible and to facilitate reconstruction in case of disasters which exposed the Board to losses due to disasters.

3.3.13 Conclusion

The vision of the Board to use information and communication technologies to improve the quality of services to citizens is commendable. The IT projects embarked upon by the board have the potential of transforming the age-old practices resulting in qualitative improvement in delivering of services. However, the vision of the Board was not backed up with adequate efforts in planning and operationalising the initiatives. This resulted in sub-optimal achievement of objectives of computerisation.

3.3.14 Recommendations

- The data on GIS must be maintained up-to-date to be useful for meaningful management decision making.
- Appropriate controls should be provided to take care of reconciliation and write-off and other security features in the Revenue Billing System (BGGS).
- Interface between GIS and BGGS should be established early.
- LAN-WAN facility should be put to use.
- The website of the Board needs to be updated and fine-tuned to be error- free and to properly project the profile of the Board.
- Appropriate controls and validations should be introduced to take care of accurate data inputs and outputs.
- The Board immediately needs to formulate and document IT policy and IT strategy. It needs to re-work entire strategy towards computerisation to harness true value of IT not only in enabling business but in improving processes.
- The Board should come out with a comprehensive plan addressing the issue of security of IT assets which should be complemented by a proper disaster recovery plan to ensure continuity of operations in case of an adverse event.
- Appropriate change control procedures should be adopted to make the changes to the system more orderly and with proper authority.

The above points were reported to the Government in May 2007; reply had not been received (October 2007).