CHAPTER V

NAVI MUMBAI MUNICIPAL CORPORATION

Information Technology Reviews

5.1   Information Technology (IT) Audit of Property Tax application in Navi Mumbai Municipal Corporation

Highlights

Input source documents required for data entries were inadequate and incomplete.

(Paragraph 5.1.7.1)

Business rules in respect of classification of usage and structure of properties were not properly incorporated.

(Paragraphs 5.1.7.2)

Names of persons liable for payment of property tax were not entered in respect of 570 properties and ambiguous terms were recorded against names in respect of 6148 properties.

(Paragraph 5.1.7.4)

Lack of validation controls to facilitate correct mapping of business rules led to incorrect calculation of rateable value and short levy of property tax amounting to Rs 8.84 crore.

(Paragraph 5.1.9.1)

Non existence of adequate audit trails and an IT security policy exposed the business operations to risk and the possibility of unauthorized manipulation of data.

(Paragraphs 5.1.13 and 5.1.14)

Non involvement of the user department resulted in non utilization of the application rendering Rs 9.74 lakh incurred on development of application for Property Tax unfruitful.

(Paragraphs 5.1.16.1)

5.1.1   Introduction

Navi Mumbai Municipal Corporation (NMMC) came into existence in January 1992. The City and Industrial Development Corporation (CIDCO), which was entrusted with the development of the Navi Mumbai area and for providing civic amenities hitherto, handed over the civic functions to the

Corporation. The Corporation area was divided into nine[49] wards. NMMC started collecting property tax from April 1994 through a computerized system using a Dbase III platform. Subsequently, in 1998, an application software in FoxPro was developed in-house which was in use till September 2006. From October 2006, NMMC switched over to a new application using Java with Oracle (8i) as RDBMS[50], developed by M/s Resilient Softech Pvt Ltd. The application was running with one server and six personal computers.

The database captured the following details:- (i) property details such as property numbers, names of owners, addresses;(ii) assessment details such as assessment dates, areas, usages, structures, rateable values; (iii) demand details such as demand cycles, demand amounts; (iv) collection details such as collection dates, collection amounts, collection centres, delay payment charges, notice fees and (v) issue of bills and notices .

Property tax was levied on the basis of the rateable value (RV) of land and buildings, assessable on the expected annual rental value which such properties may get when let out. Property tax was 35 *per cent* of the total receipts of NMMC for the year 2005-06. The demand and recovery of property tax for the previous five years were as follows :

(Rupees in crore)

Year	Demand	Collection
2001-02	88.44	72.68
2002-03	94.43	78.09
2003-04	103.49	80.71
2004-05	122.08	88.66
2005-06	159.00	106.29

5.1.2 *Organisational set up*

The Commissioner is the administrative head of NMMC. The Property Tax department is headed by the Deputy Assessor and Collector who is assisted by an Assistant Assessor and Collector, three Office Superintendents-cum-Recovery officers and 22 Property Tax Inspectors. The data base is maintained by one programmer and six Data Entry Operators. The receipts collected through the nine ward offices and designated bank branches are later entered into the system.

5.1.3 *Scope of Audit*

The Information Technology (IT) Audit of the property tax application was conducted during October 2006 to February 2007, covering the implementation and functioning of the application in respect of data pertaining

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[49] Airoli, Belapur, Dahisar, Digha, Ghansoli, Koparkhairane, Nerul, Turbhe and Vashi

[50] Relational Data Base Mangement System

to all the nine wards and all types of properties, viz private property in the CIDCO developed nodes, CIDCO built tenements, properties under the area of the Gaonthan Extension Scheme(GES) of CIDCO, properties located in village areas and in the Maharashtra Industrial Development Corporation (MIDC) areas.

5.1.4   *Audit objectives*

The audit objectives were to evaluate

➢   adequacy of input, processing and output controls available in the system

➢   completeness and correctness of data captured in the system

➢   incorporation of business rules in the application

➢   adequacy of security controls to ensure integrity of data and

➢   adequacy of audit trails available in the system

5.1.5   *Audit Methodology*

Audit commenced with an entry conference held on 3 October 2006 with the Municipal Commissioner and other Heads of the departments of NMMC. The application and database were reviewed with respect to relevant resolutions, rules and procedures relating to property tax. The Oracle data was analysed using CAATs[51].

5.1.6   *Audit findings*

It is imperative that the business rules are completely and correctly mapped into the application with all the necessary controls to ensure that tax is assessed and collected according to prescribed rules.

Audit observed that relevant business rules had not been completely and correctly mapped into the application. This coupled with lack of effective input, processing and output controls, resulted in incomplete and incorrect data and also had an impact on the tax collection. It was also observed that security controls were inadequate and that audit trails built into the system were weak.

These deficiencies are discussed in the following paragraphs.

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[51] Computer Assisted Audit Techniques

5.1.7   *Input controls*

Input controls ensure that data received for processing is authentic, complete, has not been previously processed, is accurate and properly authorised and is entered accurately and without duplication.

5.1.7.1   *Input source documents*

It was seen that standard input documents/forms or a standard process were not being used to enter information into the system. The input documents used were the Tabulated Ward Report (TWR) of NMMC or the Occupancy Certificates issued by other organisations like CIDCO/Town Planning Department. All necessary information, like usage of property, number of floors, structure of property, *etc*. and even name of owner, which were necessary for calculation of tax were not included in these forms. As such there was no uniformity and completeness in the information on properties recorded into the system. There was no log or register maintained for recording the source documents. In Vashi, Ghansoli and Turbhe wards, only 41, 69 and 51 Occupancy Certificates (OCs) available for total assessments of 1211, 1707 and 1582 cases. Thus the correctness of input records could also not be validated.

NMMC replied that maintenance of logs or registers in respect of source documents received was under consideration.

5.1.7.2   *Classification of properties*

It was also found that classification of properties, essential for calculation of tax with respect to the usage and property structure was not correctly captured in the system. It was noticed that no property had been recorded under banks, hotels, dispensaries, schools, colleges, hospitals *etc* in the NMMC area and 390777 out of 408091 assessments were carried out with undefined property structure.

NMMC accepted the observations and informed that errors in classification would be corrected.

5.1.7.3   *Area of property not entered*

Absence of mandatory provision to enter the area of property in the old FoxPro system resulted in non entry of area in 37285 out of 408091 assessments.

NMMC stated that necessary corrections in the data would be made.

5.1.7.4 *Names of persons liable for payment of property tax not entered*

Rule 9(c) of CHAPTER VIII of the BPMC Act 1949 stipulates that names of persons primarily liable for payment of property taxes should be recorded. Analysis of the database revealed that names of persons were not entered in respect of 570 properties, and ambiguous terms such as 'HOLDER OF THE PROPERTY', *etc* were recorded against names in respect of 6148 properties. .

NMMC stated that the database would be updated and necessary corrections made.

5.1.7.5 *Incorrect and incomplete names of collection centre for payments*

The ward offices of NMMC and a number of designated bank branches are approved as collection centres for depositing property taxes.

Analysis of data relating to collection revealed that in addition to the approved collection centres, incorrect centre names such as '!', DX,Q, X, b, c, m, n, X, bill Junction *etc* appeared in the data, against which there were 38,1, 14309, 0,199,24,17294, 13283,51425 and 1 receipts respectively.

Further, 11162 receipts pertaining to the period from 1995 to 2004, recorded without the collection centre code in the old FoxPro database were not updated before migrating the same into the new Oracle system.

Thus collection centre-wise MIS reports generated from the database were incorrect and could not be reconciled.

NMMC stated that necessary modification in the data would be carried out.

5.1.7.6 *Duplicate assessment records of properties*

The assessments should be identified as unique records in the database, based on property codes and dates of assessment.

Audit observed that absence of input controls to restrict the duplication of data entry of an assessment resulted in 5878 assessments entered twice, one assessment entered three times and seven assessments entered four times. Acceptance of duplicate records indicated a risk of some property not being assessed at all, if it shared a duplicate number with some other property, or duplicate demands being generated by the system.

NMMC stated that duplicate records would be rectified or deleted from the database.

5.1.8   *No control procedure to ensure correctness of data entry of receipts*

Copies of receipts for collections against property tax bills which are received in the ward offices of NMMC and designated bank branches are sent to the computer cell for data entry. To ensure the completeness and correctness of the tax collections captured in the system, the same is required to be reconciled with actual receipts. The total collection of property tax reported by the nine ward offices for the year 2005-06 was Rs 105.44 crore as against the figure of Rs 106.59 crore available in the database. In the absence of reconciliation, the figures for total collection could not be vouched for by audit.

NMMC stated that reconciliation would be done.

5.1.9   ***Non mapping of business rules in the application and absence of validation controls***

All the relevant business rules are required to be identified and suitably incorporated in the application to avail the benefits of information technology and achieve objectives of computerization. Data analysis revealed business rules had not been mapped resulting in revenue loss as detailed below.

5.1.9.1   ***Incorrect calculation of rateable value resulting into short levy of Rs 8.84* crore**

Rule 7 of Chapter VIII of the Bombay Provincial Municipal Corporation Act (BPMC Act), 1949 stipulated that the RV should be determined on the basis of the annual rent at which a property might reasonably be expected to be let from year to year. The letting rates for various types of properties are prescribed by NMMC.

Audit observed that incorrect assessments were made due to

- application of incorrect letting rates during the assessment of property tax as shown in **Appendix XII**.

- condition for the minimum rent was not applied in arriving at the letting rates in respect of 515 cases

This led to short levy of property tax amounting to Rs 8.81 crore and Rs 2.72 lakh respectively.

NMMC accepted the errors in valuation of properties due to oversight and agreed to review and revise the assessments if found incorrect.

It was also observed that different letting rates were adopted for properties under similar usage in the same area the reasons for which were not on record.

In the absence of guidelines on calculation of RV in respect of properties in MIDC area, the impact could not be analysed.

Reply of NMMC in this regard is awaited.

5.1.10   *Recommendations:*

NMMC should :

- **Design appropriate input source documents to facilitate data input**

- **Facilitate necessary input and validation controls to prevent errors during data input**

- **Modify the system by incorporating validations for ensuring correct mapping of all business rules**

5.1.11   *System design*

Various lacunae were noticed in the system design as detailed below.

5.1.11.1   *Important fields not provided for in the database*

Audit observed that the new Oracle based system did not provide for data entry of certain important information such as year of construction of property and reasons for reassessment, which were available in the old FoxPro based system, leading to non migration of the legacy data to the new system.

NMMC stated that the said data would be migrated.

5.1.11.2   *Module not designed to handle the entry of bounced cheques*

The tax amount in respect of bounced cheques is required to be shown as outstanding in the subsequent bills and recovery is to be effected.

In 1617 cases, the amount of property tax received was shown as zero, indicating deletion of data. NMMC stated that entries with zero amounts of collection were due to bounced cheques. It was noticed that no separate module was designed in the application to handle such cases. Thus, NMMC followed a system of making the collection zero when information on a bounced cheque was received. Further, it was observed that the ward offices also did not submit the details of bounced cheques regularly. Audit observed that in respect of one ward office, information on bounced cheques between November 2003 and January 2005 were not entered in the system. As a result, subsequent demands of property tax in 17 cases generated were lesser by Rs 2.10 lakh.

NMMC stated that action had been taken in respect of the above 17 cases and reverse entries had been made in the system and the procedure of collecting information on bounced cheques would be streamlined.

However, the requirement of the provision to be built into the system is reiterated.

5.1.11.3   MIS reports not designed

Management Information System (MIS) reports on the tax assessed, demand raised and collected are essential for timely and effective monitoring of property tax collections. Audit observed that there were no such MIS reports designed in the application.

5.1.12   Recommendations

- **NMMC should devise a mechanism in the system to incorporate cases of bounced cheques and design the essential MIS reports in the system**

5.1.13   Security

By way of enunciating an IT security policy, the organisation demonstrates its ability to reasonably protect all business critical information and related information processing assets from loss, damage or abuse.

5.1.14   Inadequate audit trails

Audit trail which depicts the flow of transactions is necessary in a system in order to track the history of transactions, system failures, erroneous transactions, changes/modifications in data *etc*. It was observed that adequate audit trails did not exist in the system as detailed below.

5.1.14.1   Data modified without proper authorisation

Modification of data should be properly monitored and authorized in order to check unauthorized data manipulation.

The software was designed to calculate the notice fee and Delayed Payment Charges (DPC) simultaneously. In 5578 cases though notice fees were charged indicating delays in payment, DPC was not charged. Reasons for not charging DPC were not recorded.

NMMC stated that DPC was waived off in all the above cases.

The reply is not acceptable as no audit trail had been built into the system to capture the reasons, date of such modification, the persons authorising these modifications. Further, no basic records for both modification and waiver were

furnished. In absence of audit trails and manual records, risk of manipulation could not be ruled out.

5.1.14.2   Missing Assessment records

The assesses are identified by property tax account numbers/property codes based on the ward to which the properties belong. Analysis of the property data revealed that there were 6017 gaps in the series of account numbers / property codes.

NMMC stated that due to various reasons such as amalgamations and sub divisions of properties and exemptions granted, the records had been deleted from the database.

The reply is not acceptable as no manual record or audit trail was available.

5.1.14.3   Lack of IT security policy

It was observed that no security policy has been formulated. Further, while there were only six data entry operators, in the database 147 users had been given access.

NMMC stated that the database administrator was manning the security policy at the database centers and a documented security policy would be prepared.

5.1.14.4   Lack of disaster recovery plan

There exists no documented IT disaster recovery plan in NMMC. Further, backups were not taken on CD and kept offsite and were stored in the same server.

NMMC stated that a documented disaster recovery policy would be prepared.

5.1.15   Recommendations

- **IT security policy and disaster recovery plan should be formulated and implemented.**

- **Backup of data should be taken regularly and stored off site.**

- **An audit trail to track the transactions should be inbuilt in the system to monitor changes made in the data.**

5.1.16   Other points of interest

5.1.16.1   Unfruitful expenditure of Rs 9.74 lakh on development of the application for Property Tax

M/s ACE Televoice and Services was awarded a work order amounting Rs 28.80 lakh for computerisation in Health and Property Tax departments of the NMMC in May 2001 and Rs 4.30 lakh was paid for preparation of the SRS in January 2002. However, the scope of the work was modified and a revised work order for development of applications for property tax and water billing amounting to Rs 11.80 lakh was awarded to the same agency against which payments of Rs 5.44 lakh towards development of application for property tax was made in April 2003. It was noticed that application for property tax was not implemented.

Thus, the total expenditure of Rs 9.74 lakh paid on account of development of an application package for property tax was unfruitful. Further, the work order for the new application for property tax was awarded in November 2005 to M/s Resilient Softech Private Ltd at a cost of Rs 2.00 lakh and the application was under implementation.

NMMC attributed the reason for non implementation of the application developed by M/s ACE Televoice to the lack of involvement of the user department, even though vendor support was available for two years. This indicated lack of coordination and non involvement of the user department in the development and implementation of the application.

5.1.17   Conclusion

The general objective of the computerization of property tax functions was to reap the benefits of information technology to improve operational performance besides providing error free and better services to the tax payers. However, even after nine years of computerization, NMMC could not evolve an error free application. NMMC did not maintain proper input records to support data entries relating to assessments. Lack of sufficient input controls along with inadequate monitoring resulted in incomplete and incorrect database. This led to irregular fixation of rateable value and non-adherence to the conditions of minimum rateable value, there by impacting the collection of revenue. MIS reports in respect of demand and recovery were not designed in the application. Receipts entered in the system were not reconciled with manually reported totals received from banks/ward offices indicating poor management controls. Poor security controls and lack of audit trails made the system vulnerable to unauthorized manipulation.

The matter was referred to Government in April 2007. Reply had not been received (December 2007).

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5.2   Information Technology (IT) Audit of the Water Billing Application in Navi Mumbai Municipal Corporation

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Highlights

Incorrect data on average quantity of water consumption in case of meters that were out of order resulted in under charging of water bills amounting to Rs 22.39 lakh

(Paragraph 5.2.6.2)

Audit analysis revealed that there was difference of Rs 1.11 lakh for the year 2005-06 in respect of receipts reported by ward offices and receipts entered in the computerized system. No action was taken to reconcile the difference

(Paragraph 5.2.6.5)

Incorrect mapping of business rules in respect of calculation of Delayed Payment Charges (DPC) resulted in DPC amounting to Rs 23.21 lakh not being charged

(Paragraph 5.2.8.1)

Erroneous mapping of business rules and manual intervention in respect of calculation of penalty resulted in penalty amount of Rs 81.97 lakh being short levied

(Paragraph 5.2.8.2)

Inadequate IT security controls and lack of a disaster recovery plan exposed the business operations to risk of system failure and unauthorized manipulation of data

(Paragraph 5.2.12.1 and 5.2.12.2)

Audit trail was not available in respect of reduction in opening balance of bills by Rs 16.16 lakh.

(Paragraph 5.2.12.3.2)

Non recovery of difference between the old rates and enhanced rate of security deposit amounting to Rs 1.07 crore

(Paragraph 5.2.14.1)

Modification of data without audit trail resulted in non charging of DPC in respect of water charges amounting to Rs 3.94 crore from   village consumers

(Paragraph 5.2.14.2)

5.2.1   Introduction

Navi Mumbai Municipal Corporation (NMMC) came into existence in January 1992. The City and Industrial Development Corporation (CIDCO),

which was entrusted with the development of the Navi Mumbai area and for providing civic amenities hitherto, handed over the civic functions to the Corporation. The Corporation area was divided into nine[52] wards. The function of water supply in the Corporation area continued to be with CIDCO till November 1999, after which it was handed over to NMMC in December of the same year.

Water bills in respect of all types of consumers[53], namely metered, flat rate, village and slum consumers were processed bi-monthly through the computerized application installed at NMMC headquarters. Meter readings in respect of metered consumers were recorded by the water supply sections in ward offices and forwarded to the headquarters office where the application was installed for data entry. Bi-monthly bills were generated from the application and were sent to the ward branches for further distribution to the consumers. The receipts were collected through the ward offices and designated bank branches and were also sent to the headquarters for data entry.

NMMC developed and implemented the 'water billing' application in October 2002 in Oracle 9i as RDBMS and Visual Basic 6 as the front end tool. The hardware for the application consisted of one Linux server (Red Hat Enterprises Linux 4.0 version), four personal computers and one line printer connected through LAN. The application handled functions such as maintaining details of consumers, water meter readings, bill generation and collections in respect of all wards.

Water tax constituted 13 *per cent* of the total receipts of NMMC for the year 2005-06. The demands and recovery of water tax for the previous three years were as follows:-

(Rupees in crore)

Year	Demands	Recovery
2003-04	42.30	34.47
2004-05	40.45	34.85
2005-06	58.90	39.16

5.2.2   *Organisational set up*

The Commissioner is the administrative head of NMMC. The Executive Engineer, Water Supply Department supervises the computerised water billing

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[52] Airoli, Belapur, Dahisar, Digha, Ghansoli, Koparkhairane, Nerul, Turbhe and Vashi
[53] Metered consumers were consumers having water meters and charged according to meter readings; flat rate consumers were residents of CIDCO built tenements who were charged a fixed amount each month; village consumers were consumers residing in original villages and were charged a fixed amount each month and slum consumers were consumers for which common stand post connections had been provided and who were charged a fixed amount each month

system and is supported by three Deputy Engineers (DE) for the eight[54] wards where water is supplied by NMMC, Eight Junior Engineers (JE) in each of these wards and four Data Entry Operators, who are responsible for data entry and processing of data through the computerised system at headquarters.

5.2.3 Scope of audit

The Information Technology (IT) Audit of the water billing application was conducted during October 2006 to February 2007 and covered the implementation and functioning of the application with respect to data pertaining to eight wards of the Corporation.

5.2.4 Audit objectives

The audit objectives were to evaluate

➢ methodology adopted for system development

➢ efficiency and effectiveness of the water billing application

➢ adequacy of input, processing and output controls available in the system

➢ completeness and correctness of data captured in the system

➢ incorporation of business rules in the application

➢ adequacy of security controls to ensure the integrity of data and

➢ adequacy of audit trails available in the system

5.2.5 Audit Methodology

The audit commenced with an entry conference held on 3 October 2006 with the Municipal Commissioner and other Heads of departments of NMMC. The application and database were reviewed with respect to relevant resolutions, rules and procedures relating to water billing. The audit analysis was done using the IDEA package.

5.2.6 Audit Findings

5.2.6.1 Input Controls

Input controls ensure that data received for processing is genuine, complete, not previously processed, accurate, properly authorised and entered accurately and without duplication. Input controls also serve as an effective measure to detect or prevent error or fraud in a computerised system. Analysis revealed the following issues relating to lack of input controls.

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[54] Airoli, Belapur, Dahisar, Digha, Ghansoli, Koparkhairane, Nerul, Turbhe and Vashi, ward, water was not being supplied by NMMC

5.2.6.2 *Incorrect data on average quantity and under charging of water bills*

According to rules, in cases of water meters that are out of order or are missing, water bills for the first two months should be charged based on the average of the previous four months.

Analysis revealed that average quantities entered in the system during June 2003 to July 2006, were lesser in 2654 cases, resulting in under charging of water bills by Rs 22.39 lakh. In the absence of the above mentioned rule being built into the system, the average quantity was calculated manually and fed into the system.

NMMC stated that in these cases average for one day was taken into account from the previous four months' water consumption and accordingly, average bills were generated for the current bill period.

The reply is not relevant as the business rules were not duly incorporated in the application and the data was fed manually after calculation into the system.

5.2.6.3 *Meter numbers not recorded*

It is observed that entry of meter numbers to identify the water meters installed was kept as optional. As a result, meter numbers were not available or were entered as 0 in respect of meter readings relating to 10 consumers and 741 consumers respectively.

NMMC stated that the above mentioned cases pertained to village consumers who had not installed meters after their old meters were damaged or stolen.

The reply is irrelevant as it did not pertain to the point made by audit.

5.2.6.4 *Dates of meters being out of order or changed not recorded*

In cases of meters which were reported to be out of order, date from which such meters were not working and date of change of meters should have been captured in the application to calculate and levy penalty as per rule.

Analysis revealed that since entry of such information had not been made mandatory, such dates were not entered in 3255 and 1524 cases respectively. Accordingly, it was not possible for NMMC to levy any penalty as per rule on the consumers for not getting their meters rectified.

Further analysis revealed that the meters were out of order for abnormal periods of over one year (till July 2006) in respect of 275 consumers.

NMMC stated that suitable action would be taken to fill the left out cases and meters remaining out of order for abnormal periods.

5.2.6.5   *No control procedure to ensure correctness of data entry of receipts*

To ensure completeness and correctness of data relating to collection captured in the system, the same is required to be reconciled with the details of monthly receipts reported by the ward offices.

It was observed that the procedure of reconciliation was not in place. There existed a difference of Rs 1.11 lakh between the database and the figures as per the department records for the year 2005-06 which was yet to be reconciled. No action was taken to reconcile the difference. This indicated incorrect or incomplete data entry into the system.

NMMC stated that action would be taken in this regard.

5.2.7   *Recommendations:*

- Manual intervention should be minimized in data entry

- Entry of meter numbers, date *etc* should be made mandatory

- Complete and correct entry of data should be ensured

5.2.8   *Lack of processing controls*

Processing controls within a computer application should ensure that processing is complete and accurate. Audit findings with regard to loss of revenue as a result of weak processing controls are discussed below:

5.2.8.1   *Incorrect mapping of business rules resulted in short levy of delayed payment charges amounting to Rs 23.21 lakh*

Delayed Payment Charges (DPC) is required to be levied on consumers at 18 *per cent* per annum for delays in payments of water bills. As each billing cycle is of a two month period, DPC *at* 3 *per cent* per cycle is to be charged.

Audit analysis of data revealed that in cases where bills were generated for two billing cycles, DPC was charged at 3 *per cent* instead of 6 *per cent.* Audit scrutiny of the application system revealed that the short levy had resulted due to a lacuna in the application as the DPC rate of 3 *per cent* was hard coded into the application, instead of linking it with the number of billing cycles. This resulted in short levy of DPC charges amounting to Rs 23.21 lakh as detailed in the following statement :

Type of rates	Bill date	No of cases	DPC to be charged at 6 *per cent* (in Rupees)	DPC charged at 3 *per cent* (in Rupees)	DPC less charged (in Rupees)
Flat rate	01-05-2003	18,642	6,86,024	3,43,016	3,43,008
Meter rate	01-05-2003	2,780	17,04,924	8,52,462	8,52,462
Meter rate	30-09-2003	2,711	15,02,360	7,51,180	7,51,180
Flat rate	06-02-2004	17,355	7,48,736	3,74,413	3,74,413
Total		**41,488**			**23,21,063**

NMMC stated that necessary provisions would be made in the software.

5.2.8.2 Errors in mapping of business rules resulted in short levy of penalty amounting to Rs 81.97 lakh

In cases where water meters are out of order or are missing for more than two months, 50 *per cent* of the average consumption of the previous four months is to be charged as penalty for the third and fourth months. Penalty should be enhanced to 100 *per cent* from the fifth month onwards.

Audit analysis of the database revealed that there was short/non levy of penalty in respect of meters that were out of order resulting in revenue loss of Rs 81.97 lakh as shown in the following statement :

Period for which meter was faulty		Number of cases	Penalty to be charged (in Rupees)	Amount of penalty charged (in Rupees)	Penalty less charged (in Rupees)
50 *per cent* penalty was not charged for third and fourth months	Penalty not charged	931	3013629	0	3013629
	Penalty charged less than 50 *per cent*	72	188548	107037	81511
100 *per cent* Penalty was not charged for meters not repaired for continuous periods of five to 46 months	Penalty not charged	993	4101,916	0	4101916
	Penalty charged less than 100 *per cent*	563	1964038	963707	1000331
Total		2559			8197387

Audit observed that due to error in logic for calculation of the numbers of days for which the meters were faulty, penalty there on was calculated and levied wrongly as explained above.

Due to logical errors in the software, the penalty amounts had to be manually calculated and re-entered into the system. NMMC admitted the errors in penalty occurred due to error in logic and stated that the application would be suitably modified.

5.2.9   MIS reports not built into the system

It was observed in audit that MIS reports were not built into the system for watching the recovery of dues effectively. Even the classification of consumers had duplicates which would hamper the generation of any meaningful MIS. Thus the system did not have an appropriate structured data design to facilitate effective MIS.

NMMC stated that suitable changes would be made in the application and that action had been initiated to build in such MIS reports for dues and recoveries.

5.2.10   Recommendations:

▪   MIS reports should be designed in the application to monitor demand and recovery.

5.2.11   Lack of documentation

There was no documentation relating to feasibility study, user requirements, programme specification, data flow charts, input requirements, processing requirements, operational requirements, data conversion and evaluation of meeting user requirements. In the absence of documentation, the various stages of system development could not be analysed.

NMMC stated that the System Requirements Specifications (SRS) had been prepared. However, the same was not made available to audit.

5.2.12   IT Security

By enunciating an IT security policy, the organisation could reasonably protect all business critical information and related information processing assets from loss, damage or abuse.

5.2.12.1   Lack of IT security policy

It was observed that no security policy had been formulated. There were 26 user-ids available in the Database as against four data entry operators.

NMMC stated that the Database Administrator was responsible for managing the IT security and a documented security policy would be prepared.

5.2.12.2   *Lack of disaster recovery plan*

Audit observed that no documented IT disaster recovery plan existed in NMMC. It was also noticed that backups were taken in a backup server and not on removable storage devices. The copies of the backups were also not kept offsite as per good practices of IT governance.

NMMC stated that a documented disaster recovery policy would be prepared.

5.2.12.3   *Inadequate Audit trail*

An Audit trail depicts the flow of transactions in a system and is necessary in order to track the history of transactions, system failures, erroneous transactions, changes/modifications in data *etc*. It was observed that adequate audit trails did not exist in the system as detailed below :

5.2.12.3.1   *Incorrect recording of quantities for water consumption*

In the application, the quantity of water consumed was calculated based on meter readings. However, it could be edited or modified. An analysis revealed that in 129 cases, the quantity consumed was modified.

NMMC cited manual errors in data entry of quantity of water consumed for such correction/modifications. They further stated that action had been initiated to rectify the quantity of water consumed which was erroneously calculated.

However, the reply did not address the observation regarding lacunae in the system design, *i.e.*, allowing modification in the field containing quantity of water consumed and not maintaining any audit trail of such modifications being carried out in the database.

5.2.12.3.2   *Modification of opening balance of bill amount*

Water bills generated periodically consist of current demands as well as opening balances based on the difference between the previous demands raised and actual receipts. In order to reflect the correct bill amount, it is essential that the opening balances of the current bills tally with the closing balances of the previous bills.

Scrutiny of water bills generated through the computerized system revealed that the opening balances had been modified in case of 55 consumers during the period from April 2005 to September 2006, and the bill amounts had been reduced by a total of Rs 16.16 lakh. This resulted in the opening balances of current bills not matching with the closing balances of previous bills. Moreover, there was no audit trail designed in the application to record details of users responsible for effecting these modifications, dates of modifications

and reasons for such modifications. The original data stored before modifications was also not stored in a log table.

NMMC stated that due to complaints regarding meters running fast and other reasons, bills had to be rectified, resulting in differences in the opening and closing balances. NMMC further stated that the audit trail facility in respect of such exceptional changes would be incorporated in the application.

5.2.12.3.3   Missing records

The application allocates a serial number to each consumer, bill and receipt record entered into the database.

Analysis of the data base revealed gaps in the consumer numbers, bill serial numbers and receipt serial numbers as detailed below :

Year	Number of consumer codes removed	Number of bill serial numbers removed	Number of receipt serial numbers removed
2002	64	Nil	Nil
2003	3054	16641	4071
2004	6207	11783	5028
2005	81	Nil	1742
2006	Nil	Nil	2012

NMMC stated that during 2002 to 2005, in many cases, consumer codes had been entered twice in the data base and such consumer codes with related bills and receipts had been deleted which resulted in gaps in the consumer numbers, bill serial numbers and receipt serial numbers.

In the absence of any module to handle above mentioned cases and audit trails incorporating reasons for removal of records, identification of users deleting the records, date and time of deletion of records and the original data in the system, the reply of NMMC could not be verified. No manual records in this respect were also available with the department.

5.2.13   Recommendations:

▪   An audit trail should be designed in the system to monitor changes made in the data in respect of quantities of water consumed, opening balances of bills and deletion of records *etc* from the database.

▪   An IT security policy and a disaster recovery plan should be formulated and circulated widely.

■   Backup of data and application should be taken regularly and stored off site.

5.2.14   Other points of interest

5.2.14.1   Non recovery of difference in old rate and enhanced rate of security deposit amounting to Rs 1.07 crore

Security deposit (SD), at rates prescribed from time to time by NMMC is to be collected from different categories of consumers at the time of installing new water connections. The rates of SD for water supply connections were increased as per a resolution of September 2003, in respect of institutional and commercial consumers. According to the resolution, the differences in old rates and the enhanced rates of SD were to be recovered from all the existing customers in six bi-monthly instalments. An analysis revealed that in case of 257 consumers in various categories, differences of old and enhanced rates of SD amounting to Rs 1.07 crore remained to be recovered as per **Appendix XIII**.

NMMC stated that though the resolution regarding enhancement of SD was approved by the General Body of NMMC, due to persuasion by some members, the differences between the old rates and the new rates were not recovered from the existing consumers.

The observation is reiterated, in the absence of any record for such waiver.

5.2.14.2   Non recovery of DPC from GES consumers

A resolution passed by NMMC's General Body in June 2003 stipulates that water bills should be charged in respect of village consumers at Rs 40 per house per month from December 1999 to November 2002 and at Rs 50 per house per month from December 2002 onwards.

Audit further observed that although the software generates DPC on all outstanding balances, the same was modified to zero in respect of GES consumers. This resulted in non charging of DPC amounting to Rs 3.94 crore as detailed in the **Appendix XIV**.

NMMC stated that due to strong requests from public representatives, DPC was not charged from the village consumers.

The reply could not be accepted in the absence of proper authorization of the competent authority. Absence of any specific module in the application to handle such cases coupled with subsequent modification of data and absence of audit trail makes the system highly vulnerable.

5.2.15   Conclusion

The general objective of computerization of the water billing system was to reap the benefits of information technology to improve operational performance besides providing error free and faster services to the consumers. However, even after four years of computerization of the water billing system, NMMC could not evolve an error free system. Non incorporation of business rules coupled with manual intervention resulted in errors in water bills relating to incorrect charging of penalty and non levy of delayed payment charges in certain cases. Manual intervention in calculation of quantities of water consumed and data entry impacted the collection of revenue. Absence of MIS reports in respect of demand and recovery of water charges, reconciliation of receipts, numbers of meter not functioning *etc*., were not available in the application indicating deficient management control. The absence of audit trails coupled with lack of security policy made the system highly vulnerable.

The matter was referred to Government in April 2007; reply had not been received (December 2007).