

CHAPTER 4

Rail Coach Factory, Kapurthala, Information Technology Audit of Chittaranjan Locomotive Works, Material Management Systems Chittaranjan and Western Railway

4.1 Highlights

Users were not involved in the development phase of the application in Chittaranjan Locomotive Works. The systems developed in Rail Coach Factory and Chittaranjan Locomotive Works were deficient and were not capturing vital data necessitating manual intervention.

(Para 4.5)

General controls encompassing disaster management plan, access controls, change management controls and segregation of duties were inadequate rendering the systems vulnerable to unauthorized access.

(Paras 4.6.1 to 4.6.8)

Application controls were deficient leading to irregularities in master files and transaction files casting doubts on data integrity. The unique number assigned to every item of stock was improperly accepted by the system in Chittaranjan Locomotive Works

(Paras 4.7.1 to 4.7.5)

The systems were not optimally utilised leading to excess procurement of stores. Also inventories were held beyond the prescribed norms.

(Paras 4.8.1 and 4.8.2)

4.2 Introduction

Materials play a vital role in Indian Railways' operation, maintenance and in house production activities. Materials management involves timely availability of stores to the users and it comprises different stages viz; planning and programming, purchasing, inventory control including, inter-alia, receiving and allocation, warehousing, transportation, material handling and disposal of scrap. A successful inventory management enhances user satisfaction by making available the right quantity of materials at the right time, without unnecessary blocking up of capital.

Indian Railways have adopted different computerised material management/inventory management systems in its zonal railways/production units. IT audit of the computerised material management systems was conducted over two production units- Rail Coach Factory, Kapurthala (RCF), Chittaranjan Locomotive Works, Chittaranjan (CLW) and Western Railway (WR).

Rail Coach Factory, Kapurthala

Rail Coach Factory, Kapurthala computerised the planning process, procurement and depot related activities in 1990, by developing two applications i.e. Purchase and Store Management applications in close co-

operation with Tata Consultancy Services (TCS) Ltd. Subsequently, to overcome the existing deficiencies and non-availability of support on the earlier proprietary software RCF developed (December 2003) and implemented a new application software 'Material Management System' (MMS) through in-house efforts. In 2003-04, the hardware and software systems were upgraded on turn key basis at a cost of Rs.3.10 crore.

The MMS application consists of seven modules viz. Master Module, Planning Module, Purchase Module, Depot Module, Quality Module, Report Module and Vendor Report Module. There were 566 users of the MMS application. The MMS application interfaces with Personal Information System (PINS) and Financial Accounting System (FACT).

The General Administration and Information Technology (GAIT) responsible for IT related activities, is headed by Chief Mechanical Engineer (IT) and assisted by three Deputy Chief Mechanical Engineers (IT) apart from supporting staff.

Chittaranjan Locomotive Works

Chittaranjan Locomotive Works, Chittaranjan implemented a computerised Inventory Management in February 1999, as a decision support system for better management of inventory. M/s. HCL developed the PC based client Server on HP UNIX (Operating System), Sybase as Relational Database Management System (RDBMS) and Power Builder as front end, at a cost of Rs.0.51 crore. The programming language is MF-COBOL¹⁶ and ESQ¹⁷ COBOL.

A Senior Electronic Data Processing Manager heads the EDP center under the supervision of the Financial Advisor and Chief Accounts Officer.

Western Railway

A comprehensive material management system was designed (January 1984) by Central Railway in COBOL¹⁸ with seven modules, which were to be implemented by all zonal railways. Certain deficiencies in the system were pointed out during a review of the performance of the system in the Report of the Comptroller and Auditor General of India Union Government (Railways), No.9A of 2002. Subsequently, a new on-line Material Management Information System (MMIS) was to be developed by Central Railway for implementation over all zonal Railways including WR. The status of development and deployment of the new system is awaited. The present Material Management Information System (MMIS) in WR uses one data file 'Stock Master' which records all the receipts and issues of stores material. Depots maintain the stock master files in stand-alone personal computers. The monthly transaction data is brought to the EDP centre, fed into MMIS and a combined stock master is compiled. The system generates price ledgers and managerial reports as required by the Controller of Stores.

¹⁶ **Micro Focus - COBOL**

¹⁷ **Eiffel Structural Query Language**

¹⁸ **Common Business Oriented Language**

4.3 Audit objectives

The Audit of the Information Technology (IT) applications prevailing in RCF, CLW and WR for management of inventories was conducted with a view to assessing

- the comprehensiveness and effectiveness of the systems developed;
- the adequacy and effectiveness of general controls to administer and implement the IT applications;
- the adequacy and effectiveness of the application controls and whether the systems were operating in accordance with the designed objectives;
- whether the applications developed were in consonance with codal provisions, extant rules and regulations of material management in the Indian Railways; and
- whether the objectives of material management were achieved and inventory holding was optimized.

4.4 Scope and methodology

The scope of audit encompassed the evaluation of the computerised systems through a test check of records of IT and EDP centers, Planning, Stores and Accounts wings. While conducting audit, a top down approach was followed. Relevant documents/ records were scrutinised and concerned officers were interviewed for evaluating general controls. The Computer Assisted Audit Techniques (CAATs) and audit software Interactive Data Extraction Analysis (IDEA) were employed in evaluation and substantive testing of application controls. Structured Query Language (SQL) was also employed to query the databases.

4.5 Deficiencies in system development

An understanding of the information requirements, systems specification and user's description of the application is a prerequisite for effective system development.

- Audit observed that the information requirement and corresponding system specification was not prepared while developing a computerised inventory management system in CLW. Users were not involved in the developmental phase and the system development was left to the discretion of the vendor, leading to the system not capturing the Anticipated Annual Consumption, which was essential to estimate the quantum of procurement. Moreover the system was unable to compute Economic Order Quantity, a vital tool that assists the management in minimizing the ordering and inventory carrying costs. CLW conceded that users were not involved at the developmental stage and agreed to explore the possibility of incorporating the concept of Economic Order Quantity in the system.
- In RCF, some features in the computerised system were being managed manually rendering the system vulnerable to manipulation.

As per codal provisions materials issued on loan basis to other railways, when received back, are to be taken into stock at the original issue price at which they were issued. The application failed to link such transactions with the original cost at which the stores were previously issued. These types of stores transactions were recorded in the Miscellaneous Advances Account maintained manually. The system also did not generate the Stock Adjustment Account (SAA), which was maintained manually.

- The system in RCF did not provide any information whether stock verification of a PL item was conducted as per codal requirements.

4.6 Deficient general controls

General controls to administer and implement the range of applications run in a computer environment were weak. Audit observed that there was no security policy or a proper disaster recovery plan prepared by the railway administration. Access controls and change management controls were also deficient, rendering the system vulnerable to unauthorised access.

4.6.1 Lack of an IT strategic plan

No IT steering committee was in place to formulate long term and short term strategic plans for augmentation and utilisation of IT resources and to monitor their implementation.

System analysis was not carried out while implementing the MMS in RCF. Old data was migrated to the new system without ensuring its consistency and accuracy. RCF contended that the new system was just an up-gradation of the old system. The contention of RCF was not tenable since errors existing in the old system crept into the new system affecting the integrity of the new system. Records related to test data were also not available.

4.6.2 Non availability of documentation

Project documentation consisting of project completion schedule for developing and implementing MMS, manuals, standards for system analysis, programming, operation, documentation and performance monitoring were not available in RCF even though the new system was implemented in December 2003. Only User Manual of Material Management System was available. RCF stated that Programming Manual and Operation Manual were under preparation.

4.6.3 Disaster management and business continuity plan

Chittaranjan Locomotive Works had not prepared detailed disaster management plan comprising of components such as emergency plan, back-up plan, recovery plan and test plan against threats such as fire, power-cuts, physical damage and theft.

Disaster management plan in place in RCF was neither formally approved nor tested. The resource requirements in terms of alternate machines/ communication channels and plans for relocation of personnel and diversion

of support services to alternate emergency accommodation in the event of a disaster were not spelt out. Responsible officials were not fully aware of the disaster plan. Disaster management plan was, therefore inadequate to revive the business within an affordable time indicating exposure to significant risk.

The back-up policy of IT Department of RCF provided that all maintenance activities relating to the Operating System would be handled by the contractor, M/s CMC Ltd, by taking monthly system backup on tapes. However, no documentation was maintained to indicate that monthly backups of the Operating System were actually taken by the contractor. Neither was a periodicity prescribed for testing the backup data obtained nor was the backup taken ever tested to ensure its workability in case of an emergency. The safety of back-ups system and application software was not ensured. There was no policy for data retention to indicate the duration for which data was to be kept online and retained offline.

4.6.4 Lack of environmental policy for disposal of e waste

Discarded computer hardware and other non-biodegradable electronic devices are seen as threat to environment as they contain highly toxic substances like heavy metals besides being made of glass and non biodegradable materials such as plastic. CLW was disposing e-waste much like office waste thus endangering the environment. On being pointed out CLW agreed to framing and implementing an environment policy for disposal of e-waste.

4.6.5 Inadequate logical access control

User names are assigned to each of the users of the system to enable them to access the system. User names should be confidentially maintained so as to restrict access to authorized personnel only. It was observed that in both RCF and CLW, user names assigned were either on a predictable pattern or accessible to multiple users rendering the system susceptible to unauthorized access. CLW allotted user ID and passwords group wise, enabling multiple users to gain access to the system using the same user ID and password.

RCF adopted a policy of creating a user name with the employee number prefixed by 'U' on the ground of easy maintenance of user related activities. Initial passwords were not assigned, subjecting the confidentiality, integrity and availability of data to significant risk. On this being pointed by Audit, RCF stated that the database administrator had to create about 700 users in a short time, and therefore this practice was adopted. It was also stated that now user password was being created as per user preference.

No security logs for monitoring the unsuccessful attempts to log in were maintained in the system by RCF. In response to Audit observation, RCF stated that there was no need to maintain such a log since hackers cannot be trapped. The response of RCF is unacceptable as it is imperative to monitor the failed login attempts and investigate them to rule out malafide intentions.

4.6.6 Inadequate change management control

Change management controls ensure that changes in the software are properly authorized and documented and thus prevent any unauthorized version of the application being in use. In RCF, changes were carried out in the software based on the users' request in live data environment by assistant programmers and programmers and the approval of the competent authority was not on record. As a sequel, there was neither version control nor a record of amendments made in application software.

RCF contended that there were two separate environments i.e. one for production database and the other for test/ development environment and that the application being in establishment stage, many changes and logical errors required immediate rectification and it was not practically feasible to store the versions of the applications for further reference.

The reply is not acceptable as absence of version control or documentation in respect of major changes in the application could render the system susceptible to improper linkages during subsequent modifications and could also lead to the usage of incorrect version of the application.

4.6.7 Inadequate security against virus

Antivirus solutions are necessary as a means of protecting the data and the application from viruses. In RCF, antivirus solution was not available in all the terminals. RCF stated that anti virus solution for the system was in process and would be installed soon.

4.6.8 Non segregation of functions

Organisational and management controls provide for proper and clearly defined levels of responsibility by adequate separation of duties within the information-processing environment. Access to the system should be provided to users 'on a need to know and need to do basis'. In CLW, the assistant programmer assisted the senior systems analyst for the back up security of applications, in the absence of a regular system administrator. Both had access to the system and security administrator privileges simultaneously, thereby throwing up a significant control weakness.

4.7 Inadequate application controls

Application controls relate to the specific tasks performed by the system and comprise of input, processing and output controls. Application controls are designed to provide an assurance that all inputs are properly authorized and complete, validating checks are in place, processing was done as designed and outputs are accurate.

Substantive testing revealed that the application controls were inadequate resulting in improper assignment of check digit, irregularities in master data and transaction files and inconsistent outputs, as brought out below:

4.7.1 Improper assignment of check digit

In CLW, Unified List number (UL no), an eight digit unique number with the last digit being the check digit, was assigned to every stock item to validate it before incorporation in the system. Analysis of stock master revealed that although check digit numbers were assigned incorrectly in case of 13 stock items valued at Rs.2.20 crore, the system accepted these UL numbers, indicating inadequate validation checks. (**Annexure**). CLW agreed to rectify or delete these incorrect UL nos. The validation checks in the system need to be improved so that the system does not accept incorrect UL numbers.

4.7.2 Irregularities in vendor records

Data Analysis of Vendor Master and Purchase orders files in RCF revealed that input validation controls to reject incorrect data entry were inadequate. Several instances of irregularities in vendor records were seen as indicated below:

- Blank values were noticed in many fields viz. Vendor Registration Number, Registration date, Registration validity date and monetary limits for 17 registered vendors in the Vendor Master file.
- Two registered vendors were registered with the same registration number on two different dates¹⁹. In some cases, vendor registration validity date was found to be prior to vendor registration date. Vendors were found to have incomplete addresses. The status of vendors was displayed even for future dates. RCF stated that this occurred only in the old data and the problem was taken care of in the new system. RCF further stated that the users would be advised to correct the data. The reply is not acceptable since this aspect should have been taken care of while importing data to the new system as these errors impact upon managerial decision making.

4.7.3 Irregularities in purchase order data

Analysis of data files in RCF using Computer Assisted Audit Techniques (CAATs) revealed that input validation controls were deficient in as much as the system allowed erroneous data entry regarding purchase orders (POs) as follows:

- For 33 POs valuing Rs.8.12 crore, the initial delivery period, final delivery period and extended delivery period were not recorded. Out of these, 30 POs valuing Rs.8.11 crore, were placed during the year 2004. RCF responded that the issue was referred to user departments for data correction.
- 267 POs were found with zero purchase order value. The contention of RCF that the absence of constraints in the old system allowed possibility of accepting zero value in 'PO value field' was not acceptable as six out of the 267 POs pertained to the new system.

¹⁹ Code Number RE 9823 and VP 8007 registered on 28 January 2004 and 12 May 2004 respectively under one registration case number 2636.

- The material quantity recorded in the system, in respect of 68 POs, was zero. Out of these, 8 POs pertained to the year 2004. Further, test check of basic records of POs revealed that either the POs were modified manually by attaching separate annexures to indicate the quantity or were prepared separately. RCF responded that this issue was being analyzed and referred to the user departments for correction.
- In case of 85 POs pertaining to the year 2004 the material was shown to have been received even before placement of POs.

4.7.4 Deficiency in master files

IT enabled analysis of master files of the vendors, purchase orders and stock items revealed multiple instances of irregularities in the master files, some of which were illogical, casting doubts on data integrity, as indicated below:

Rail Coach Factory

- It was observed that while recording stock issues to different consignees the cumulative value of stock issues for the respective year was not being updated in the system. RCF contended that once the material was issued and the issue date updated, there was no correlation between the cumulative issues and issue date. The reply is not acceptable as, in the absence of necessary validation for calculating the cumulative issues, the annual consumption would not be reflected in the database.
- Priced Ledger (PL) numbers for 8,185 items had no stock categorization. RCF stated that stock categorization was done based on last year's consumption. RCF also stated that the items which had no categorisation, were either not used last year or were new items. The reply was not borne out by facts: 153 items out of 8,185 items mentioned above were issued during 1 April 2002 and 31 March 2004 but were still not categorized. Out of these, 31 PL numbers were issued during the year ending 31 March 2004.
- Descriptions and drawings of store items were not recorded in 120 PL numbers. In addition, more than one PL number was allotted to 41 stock items having similar description and drawings in Stock PL Master data table. RCF accepted the error and mentioned that these were very old unused items and the matter was being referred to the user department.
- The system permitted negative entries, both in the value and quantity fields. It was seen that the issue value in 18 records against eight PL numbers was shown as (-) Rs.0.14 crore. Similarly, in case of one item, the balance quantity in the database was shown as (-) 35. The contention of RCF that these belonged to the old system and this problem was rectified in the new application was factually incorrect as 11 out of the 18 records pertained to the period 14 June 2004 to 24 September 2004, i.e. after the system had been upgraded, amply indicating that these errors existed even in the new system.

- Book average rate arrived at by dividing the value balances shown in the price ledgers by the quantity balance was shown as zero in 26 cases even when stock balances existed. In two cases, the book average rate was shown as negative. RCF stated that the matter was being referred to the accounts department for rectification of data.

Chittaranjan Locomotive Works

- CAAT analysis of the database as on 25 February 2005 revealed that the value of closing balance, which is the product of quantity and the book rate, was understated by Rs.2.78 crore for 2,018 items and overstated by Rs.0.03 crore for 1,718 items. CLW conceded that this was due to an arithmetical fallacy existing in the system.
- Ten items had identical UL numbers with different descriptions.
- In respect of 718 items the database indicated receipts of the item after the last issue. However the database indicated nil closing balance, which was illogical. Similarly, for 15 items the database indicated receipt value higher than the closing balance despite absence of any issue.
- 156 items valuing Rs.0.73 crore were issued at a rate higher than the book rate.
- The system permitted negative entries both in the quantity and value fields. 334 items of stock indicated a negative closing balance of Rs.(-) 2.30 crore.
- In case of four stock items majority of the fields in the database were left blank.

Western Railway

- In 11 out of 25 depots it was observed that dates of last receipt and last issue in respect of 64 items were left blank. In the absence of this information, categorisation of stores as moving and non-moving was not possible.
- Some items were categorised simultaneously under 'Emergency' and 'Ordinary' categories.
- 50 cases, spread over seven depots, indicated receipt of material during the years 1997 to 2005. However, the closing balance was shown as 'nil' even though none of the items was issued.
- Duplicate PL numbers were found in various categories in the same depots and wards. No description was found against PL numbers in seven cases.

4.7.5 Inconsistent transactions in Data files

IT enabled audit scrutiny revealed that the data files of the application in RCF did not depict transactions correctly, as indicated below:

- An analysis of transaction data table revealed that material valuing Rs.1.94 crore belonging to 14 PL-numbers, was issued on 19 December 2003 but particulars of consignees to whom stock were issued was found blank in the relevant field. RCF stated that out of

five lakh records, only 17 records were without the names of consignee. The reply does not address the fact that the system allowed entry of incomplete data and does not take into account the risk of pilferage, which might result due to issue of material to unknown consignees.

- During the year 2004 in two cases of rejection of material received the quantity rejected was recorded as 1000 and 100 respectively but the quantity returned was recorded as 100 and 65 only, and in one case, the quantity recorded as returned was more than the quantity rejected.
- In respect of 11,096 store items, the current value recorded was found to be zero. RCF stated that the demanded quantity could be zero and consequently the current value would be zero. The reply is not acceptable as in 127 cases where current value was shown as zero, the quantity and balance in hand was found to be greater than zero.
- A review of the sample cases revealed that continuity of receipt order number in wards, as required under codal provisions, was not maintained in 42 cases.

4.8 Non-achievement of material management objectives

Inventory management concerns effective and efficient acquisition, utilization and disposal of inventory. Audit observed that in spite of implementing a computerised system for recording and managing inventory, the systems were not optimally utilized to achieve the objectives of inventory management. Stores were procured in excess of requirements and inventories were held beyond the prescribed norms, as brought out in the following paragraphs.

4.8.1 Excess procurement of stores

Analysis of the Stock Master in CLW disclosed that 24 items were purchased during February 2005 valuing Rs.0.27 crore, even though there was no annual requirement and the items were already in stock, resulting in blocking up of capital. Moreover these items were not categorized as emergent.

The contention of CLW that purchases were resorted after a review of requirement, based on production programme and availability of material was not borne out by facts.

4.8.2 Deficient monitoring of stock

As seen from the stock master, overstocking was a persistent irregularity in CLW since 1999-2000. As of February 2005, CLW had overstocked 2623 items of stores under various categories valuing Rs.69.30 crore vis-a vis the stock limits prescribed by the Stores code for various categories of stores resulting in blocking up of capital. Railway administration accepted the audit observation and agreed to implement the system for generation of overstock items.

Similarly as of 31 March 2005, WR had overstocked 3515 items of stores under various categories valuing Rs.4.52 crore.

Inventory holding also attracts the payment of dividend to general revenue as they are charged to Capital head (Loan from Central Government).

Further, 4604 items valuing Rs.161.62 crore accounting for 90.96 per cent of the total inventory had never undergone departmental verification. 25 out of the 28 'A' category items valuing Rs.48.91 crore were not physically verified. Codal provisions stipulate verification of stock by Accounts department at least once in three years and scrutiny revealed that 868 items valuing Rs.27.42 crore were not verified either by Accounts or Stores department. CLW attributed the deficiency to resource constraints and agreed to take necessary action.

4.8.3 Turnover ratio

Turnover ratio expressed as a percentage of value of physical closing balance to the value of issues during the year is an important parameter to measure the efficiency of inventory management. Indian Railways had prescribed a target of 17.13 per cent and 14 per cent for CLW and WR respectively for the year 2004-05. Review revealed that in CLW the ratio was much above the limit of 17.13 per cent throughout the year up to February 2005 (38.09 per cent) and disproportionately high issues were recorded towards the end of the year in March 2005 without physical movement of materials, to achieve the prescribed target. In WR, the year-end turn over ratio was 32 per cent as against the prescribed target of 14 per cent.

4.8.4 Surplus and non-moving stores

Codal provisions prescribe that stores which have not moved for two years should be declared as surplus, which would further be categorized as movable surplus and non-moving or dead surplus depending upon their future utility.

Stores code also provides that non-moving surplus should not exceed two percent of the closing balance of inventory.

Data analysis of stock master in CLW revealed that as of February 2005, 769 items of store valuing Rs.15.31 crore have not moved for over three years and the non-moving surplus was 6.67 per cent as against the norm of two per cent.

CLW accepted and attributed the accumulation of surplus to the changes in design and production. CLW however, differed on the magnitude of surplus stock and also mentioned that non-moving stores constituted 0.61 per cent. This was incorrect since the figures calculated in audit were based on the data provided by CLW.

Data analysis of MMIS in WR revealed that as on 31 March 2005, 527 items of non-moving surplus valuing Rs.6.95 crore were held by various depots, out of which 273 items valuing Rs.6.48 crore were added in 2004-05. Additionally 787 items valuing Rs.1.54 crore held in various depots had not moved for many years, out of which 202 items valuing Rs.0.56 crore were held for more than two years.

Railway administration could not furnish an adequate reason for not classifying these stores as non-moving surplus. Non-moving surplus was over five percent as against the norm of two percent.

Stock data table in RCF also disclosed the existence of surplus and non-moving stock. New stock valuing Rs.27.37 lakh procured before 1 January 2003, was never issued.

Such accumulation of inventory resulted in blocking up of capital apart from increasing the liability towards payment of dividend. RCF stated that further procurement of these items had been blocked.

4.9 Recommendations

- Railway administration may set up IT steering committees and formulate long term and short term plans for augmentation and effective utilization of IT resources and disposal of e-waste.
- Comprehensive disaster management plans may be formulated for each system and resource requirements may be identified for alternate location in the event of a disaster.
- Railway administration may strengthen its logical and change management control mechanisms. Organizational controls may be strengthened by proper segregation of functions.
- It is imperative to strengthen the existing validation checks and incorporating additional checks so as to enhance data integrity.
- Railway administration may effectively utilize the computerised applications and strive to achieve the objectives of inventory management by optimizing procurement and inventory holding. The codal provisions for inventory holding may be adhered to.

4.10 Conclusion

Though the computerised systems have brought about some improvements in inventory management, the material management objectives were not fully achieved as the stability of the systems is in doubt owing to lack of adequate controls. Computer outputs were inconsistent and require manual checking before managerial decisions are taken. There was scope for improvement in the systems and their procedures.

New Delhi
Dated:

(KANWAL NATH)
Deputy Comptroller and Auditor General

Countersigned

New Delhi
Dated:

(VIJAYENDRA N. KAUL)
Comptroller and Auditor General of India

