CHAPTER : VII

Bharat Electronics Limited

Information Technology Audit on the computerisation of inventory management at Bangalore Complex

Highlights

The primary objective of implementation of Integrated Information System with particular emphasis on scalability and upgradeability was not achieved.

(Para 7.4.1 and 7.4.2)

The Company has not formulated and followed proper change management procedure for modifications to the system.

(Para 7.4.3)

Procedures for integration, processing data and controls built in the system to validate the data processed were not available. Discrepancies to the tune of Rs.67.75 crore existed in the comparable data between Manufacturing Resource Planning System-II (MRP-II) and Integrated Finance Accounting System (IFAS); 350 Nos. of items valued at Rs.26.07 crore appearing in IFAS did not appear in MRP-II.

(Para 7.5.1)

Alteration of financial data in IFAS for reversal of sale of Rs.29.78 crore was done but no alterations took place with stock position.

(Para 7.5.2)

The system did not help in purchase decisions and allowed drawal of material for the work order in excess of quantity prescribed in the Bill of Material.

(Para 7.5.3)

The criterion adopted by the system for fast, slow and non moving inventories analysis was flawed and consequently material worth Rs.2.16 crore which had not moved for one to two years was identified as fast-moving in one of the divisions.

(Para 7.5.6)

Rights of access had been given to employees without analysis of minimum access requirement.

(Para 7.6.1)

There is no evidence to show that system audit envisaged in the Internal Audit Manual had been conducted.

(Para 7.6.3)

The Company did not have a proper institutionalised business continuity plan.

(Para 7 6.4)

7.1   Introduction

The Bharat Electronics Limited (BEL) was incorporated in April 1954 as a Company fully owned by the Government of India under the administrative control of the Ministry

of Defence. The Company designs, develops and manufactures electronic equipment like Radars, Communication Systems, Broadcasting and Telecommunication equipment. The major production unit at Bangalore Complex is further restructured into seven Strategic Business Units (SBU).

7.2   Computerisation in BEL, BG Complex

Though the computerisation activity commenced in 1975, the Company implemented Integrated Information System (IIS) in 1998-99. IIS mainly consists of Manufacturing Resource Planning System-II (MRP-II) supporting manufacturing functions including inventory management and Integrated Finance Accounting System (IFAS) supporting financial functions.

The Information System (IS) Department takes care of all developmental activities, troubleshooting, overall management of IS resources, expansion and IFAS data processing. Apart from this, Computer (EDP) Section at each SBU takes care of MRP-II application, data processing on this application, daily back up and access rights.

7.3   Scope of Audit and Methodology

Audit of General and Application Controls with specific emphasis on Inventory Management and related modules of MRP-II and IFAS was conducted in 2003-04 mainly to examine:

   (i)   whether planning and execution of the IIS project was effective and efficient,

   (ii)   whether Information Technology (IT) systems helped in efficient and effective Inventory Management and Control and

   (iii)   whether data and integrity of data entry were reliable and adequate.

The methodology adopted for audit included collection of information through questionnaire, test check of the system by examining the data entry with reference to source documents, personal interviews with officers of the EDP Wing and analysis of data through Computer Assisted Auditing Techniques namely, SQL* and IDEA*.

7.4   Implementation of Integrated Information System (IIS)

7.4.1   The Company implemented IIS at a total cost of Rs.13 crore with emphasis on scalability and upgradeability, to meet the business challenges faced and provide a competitive edge to the operations. The major areas covered were production planning, material control, shopfloor scheduling and real time control, design development and commercial and sales management.

7.4.2   M/s. Mascon Technical Services (P) Limited, Chennai (MTS) completed in October 1994 the software relating to MRP-II. M/s. Tata Consultancy Services (TCS) completed in March 1995 the software work relating to IFAS with time overrun of 18 months. These softwares were put to use progressively upto 1998-99, due to delay in procurement of hardware and inadequate project monitoring. During development of IIS, even though data porting* was the primary responsibility of MTS it was jointly done by MTS and the Company. Further, the Company failed to achieve objectives viz. integrity

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* *Structured Query Language*
* *Interactive Data Extraction and Analysis*
* *transferring of data to new system*

of data and upgradeability due to deficiencies in the system. Manpower problem also contributed towards delay in implementing the IIS project. Core group members were changed frequently due to resignation / transfer of the personnel during the design, development and implementation stage of IIS project. There was no specific IT recruitment policy in the Company.

7.4.3 The Company carried out many modifications and added new features to these softwares (IFAS and MRP-II) since commissioning of the system. However, the Company neither maintained any documentation of modifications nor formulated change management procedures. In the absence of proper change management procedure, the objective of scalability and upgradeability of software was defeated and Audit could not verify/assess the accuracy of the data migrated and modifications made to the softwares from time to time. The Company neither documented the testing procedures nor maintained documents to prove the accuracy of the data migrated from legacy system to IIS. Further, neither testing strategy nor documents like test reports were furnished to audit.

The Company stated that (February/June 2004)

(i)   the problems faced in porting of the data were incomplete data, duplicate data and data integrity problems.

(ii)   the integrity of data was ensured within the applications and the Company added many features/modules on account of the system's amenability to extension and improvement and was able to upgrade the hardware by adding disc space and memory. It further stated that top management did review the project regularly by constituting a Committee of Directors to oversee the implementation. The objective of scalability and upgradeability had been taken care of in the systems and in the process of change-over to the new system, the change management control problems would be addressed.

(iii)   it did not find any need to have separate formal IT recruitment policy. However, it added that it had asked M/s. TCS (whom the Company had appointed as consultant for the augmentation program of computerisation) to study and advise on the need for such policy.

The reply of the Company is not acceptable as

(i)   The methodology adopted by the Company in resolving the issues of porting could not be analysed in Audit in the absence of documentation.

(ii)   As could be seen from the Annexure-5, there was difference between IFAS and MRP-II data as on 31 March 2003. Poor documentation, change management practices followed and deficiency in Application controls in the system resulted in data available in the system being low on realiability and the system lacking upgradeability/scalability in the long run.

(iii)   To overcome the shortcomings in the existing system, the Management appointed TCS to identify the gap within three years after implementation of IIS. Further, while clarifying to the Board's Sub-Committee, TCS stated (July 2003) that the current MRP systems were developed at various points of time and hence they could not talk to each other due to which consolidation of data had to be done manually, (i.e., manual intervention still existed). The application software only

met partial requirements of the transactions and did not support process control and decision-making. Therefore, the consultant recommended implementation of Enterprise Resource Planning (ERP) at an estimated cash outflow of Rs.56.92 crore over five years. The selection of the ERP package and vendor was in progress (August 2004).

7.5   *Application Controls*

Audit of Application Controls in the system with specific emphasis on Inventory Management revealed a number of demerits in the Inventory System. The Company's MRP-II application caters to online maintenance of stock data, follow up, control and generation of documents relating to inventory. IFAS receives input from MRP-II and generates financial, material and cost accounting statements. Points observed in Audit on analysis of inventory data under MRP-II/IFAS are commented upon in succeeding paragraphs:

7.5.1   *Discrepancies in comparable stock data between MRP-II and IFAS*

The data relating to Purchase Orders, Sub-Contract Orders, Service Orders, Store Receipt Control, Sale Orders and Invoice, transaction-wise, are transferred from MRP-II to IFAS in respect of the previous month as database dump to IFAS system in batch mode.

The checks and validation required for IFAS like total number of transactions being transmitted, date of transactions, validity of transactions, and key field entries to IFAS are being carried out at entry stage in MRP-II. However, the controls built in the system to validate the transferred data processed in IFAS are not available. It was also observed that the system generated the error-list of data transferred from MRP-II to IFAS at the time of monthly processing. It was clarified to Audit that the error-list generated during the process of data transfer from MRP-II to IFAS was being corrected. However, no documentation was maintained to check the accuracy of data corrected and number of errors detected over a period of time. In view of the above, discrepancies existed in the comparable data between the two systems identified by the Company, as detailed below:

Division	Total items in MRP-II	Total items in IFAS	Items in MRP but not in IFAS	Items in IFAS but not in MRP-II	No. of Cases where IFAS stock is less than MRP-II	No of Cases where MRP-II stock is less than IFAS	Unit discre-pancies
Digital Communication Systems	13028	12536	55	20	141	110	5
High Frequency	17697	15187	16	12	63	46	4
Low Power Equipment	38888	19655	134	40	262	112	5

In order to examine the discrepancies, Audit carried out a test-check of comparable data of inventory of raw material and finished goods available in MRP-II and IFAS as on 31

March 2003. The test check revealed that (i) raw material stock valued at Rs.64.47 crore and finished stock valued at Rs.3.28 crore figuring in MRP-II, did not find place in IFAS and (ii) 350 items of raw material valued at Rs.26.07 crore figuring in IFAS did not find place in MRP-II. Thus, the reliability of data was low and non-reconciliation of data between MRP-II and IFAS vitiated the accuracy of financial statements.

The Company stated (June 2004) that MRP-II assisted in planning, procurement, issue of material etc. on on-line basis. The data relating to quantity of inventory of MRP-II was transferred to IFAS and processed for preparation of material ledger, age-wise analysis etc. in batch mode. Hence they were on different modes and not comparable at value level. All the entries including adjustment values were recorded only in IFAS. However, the Management also stated that efforts were on to reconcile MRP-II and IFAS balances at quantity level on continuous basis. The Company agreed to address these issues in the new system (ERP), for avoiding such data discrepancies.

The absence of reconciliation and necessary adjustments in MRP-II posed a serious risk to the planning and procurement decisions based on the unadjusted MRP-II data.

7.5.2 Non-adjustment of finished Goods (FG) stock in the event of reversal of sale

The Company was effecting sales by entering the transaction in the system with documents such as Invoices, Goods Consignment Notes, Material Gate Pass etc. These were simultaneous actions based on which the sale action was completed and the property passed on to the customer. When the sale was effected, the system generated Stores Issue Voucher (SIV or Invoice) which formed the basis for decreasing the quantity in FG stock by the system.

Audit observed (April 2004) that during 2002-03, in respect of 306 items valued at Rs.29.78 crore, the system had entries of SIV, Goods Carrier (GC) Note, and accordingly the system recognised the sale and the FG stock in the system was reduced. However, the Company reversed the sales in June 2003 by altering the invoice date and value in the IFAS; the quantity of those items in IFAS and MRP-II remained unaltered. Thus, the system was allowing alteration of the date of invoice and value without correspondingly updating the stock position.

The Management stated (June 2004) that because of the announcement of Truckers' strike, the consignment was not lifted by the transporters before 31 March 2003; hence reversal entry was made in the books. It also stated that same SIVs were used to account for the subsequent sale because it would facilitate clearance with excise/sales tax authorities. It added that necessary improvements, if any, would be considered while introducing the new system.

The Management, thus, accepted that before 31 March 2003 the consignment in question was not despatched which showed that the validation checks exercised for sales transaction like entering correct GC Note, etc. were not adequate.

7.5.3 Drawal of material in excess of Bill of Material (BOM) quantities

The BOM Module is used for drawing material for production of an item. On a test-check, it was found that the application allowed drawal of material for the work order in excess of quantity prescribed in the BOM as illustrated below:

Part No.	Work order No.	Required Qty. as per BOM	Actual Qty. issued to work order	Excess quantity
2124 322 201 36	960146	24	28	4
2124 480 201 75	960146	24	28	4
2124 364 901 73	960151	13	36	23

The Management stated (June 2004) that as the lead time required to manufacture these items was two to three months, a few extra were launched to cope with shop floor rejections. The reply is not acceptable as drawal of material in excess of quantity indicated in BOM amounts to lack of proper validation checks. Further, in case of necessity of excess quantity on account of genuine reasons, the procedure as laid down in the Purchase Manual (i.e., drawal through Pink Stores Requisition) was required to be followed to regulate the transaction through the system.

7.5.4 Non-netting of quantities while processing Purchase Requisition (PR)

In the process of generation of PR, the system was not able to identify whether the items included in the PR were available with other SBU or not. Hence the SBU had to resort to oral confirmation. Thus, the system did not help in purchase decisions.

The Management stated (June 2004) that the common items were held in Common Material Control (CMC) division and items held in a division were unique to its requirement. The reply is not acceptable as there were many internal transfers of items other than CMC-held items between divisions. However, in its reply, the Company conceded that netting across the SBUs would be taken care of in the proposed new system.

7.5.5 Non-closure of work orders after completion

It was observed that majority of work orders were not closed in the system even though work was completed. It may be noticed from the table below, based on a report generated by Audit from the system, that the work orders opened during a year were always more than the work orders closed during the year.

Year	1999-00		2000-01		2001-02		2002-03	
SBU	No. of Work orders opened	No. of Work orders closed	No. of Work orders opened	No. of Work orders closed	No. of Work orders opened	No. of Work orders closed	No .of Work orders opened	No. of Work orders closed
Naval	420	152	143	21	196	15	42	0
Low Power Equipment	352	11	174	7	108	1	69	0
Broadcast and Television	228	0	111	0	124	1	152	6
Radar	656	97	99	23	66	5	107	0

Components	54	0	698	0	1627	2	1376	0
High Frequency	243	0	119	0	37	1	60	0

On this being pointed out in Audit, the Management took action to close 103 work orders in August 2003 and initiated action to review the position of closing of work orders. However, the Company did not elaborate (June 2004) on how it planned to consider automation of closure of work orders immediately after work order activity was closed so as to eliminate scope for drawal/adjustment of material through closed work orders.

7.5.6 *Wrong programme logic in analysis of Fast, Slow and Non-Moving (FSN) Inventory*

An analysis of inventory held on 31 March is carried out every year to identify slow-moving and non-moving items. The objective of FSN analysis is to identify items which have not moved for many years and analyse the same for their utility. Based on the FSN reports, review of items which have not moved for more than five years is carried out by internal committees to recommend write-off and disposal. For the purpose of analysis, the system classifies items not moved for more than two years as non-moving inventory and items whose movement is less than 10 per cent of the opening balance of a particular year as slow-moving inventory. The inter-departmental transfer of items is not considered as consumption for the year. The remaining items are classified as fast moving inventory.

On a check of data relating to FSN, following flaw in the programme logic was noticed.

(i) Items valued at Rs.2.16 crore, which have not moved for more than one year but less than two years, were classified as fast-moving inventory.

(ii) Out of the inventory of Rs.2.13 crore pertaining to Central (D&E) Division, inventory valued at Rs.2.11 crore was classified as fast-moving and Rs.2 lakh was classified as slow-moving. On verification, it was found that almost all the inventory held by the Division had been transferred from Common D&E Division during July 2001 and was more than five years old.

The Company stated (October 2003) that the system would be reviewed to classify the items, which had not moved between one and two years also as slow moving inventory. It was also stated that the transfer of materials from one store to another during July 2001 was inadvertently accepted as fresh receipt and the mistake had since being rectified.

7.6 *Deficiencies in General Controls*

7.6.1 As per instructions (July 2001) regarding access controls, the computer centre should compile the list of Forms (for insert/update/delete/report access right) for each employee in consultation with Departmental Heads and obtain written approval. However, it was observed that:

(i) In HF Division - Computer Centre, no written approvals for providing access to the staff were available.

(ii) In Central Material Management Department, general authorisation was given to 68 employees without making proper analysis of minimum access requirement to discharge their duties.

(iii)   Report and Query rights (read only) associated with the module were provided generally to all the employees, working in the respective module, without making analysis of need to know/need to work.

(iv)   Based on the Audit observations, the Company issued instructions to all Departmental Heads to review and confirm permission already given to each user and to advise the Computer Centre in writing about changes, if any.

7.6.2   The Company has not acted upon the important suggestion made in the Security Manual relating to IT system to have a separate security server administering all terminals. TCS also had opined that IT securities implemented by the Company were in pockets and were not adequate, constituting security risk.

The Management stated (June 2004) that the security needs as relevant in 1990 were addressed. They agreed to formulate a security policy and procedure.

Further, the Ministry of Defence (MOD) in June 2001, had issued certain computer security guidelines and had instructed all Defence PSUs to follow them. Following guidelines were not complied with by the Company.

(i)   The Company had not assessed the exact requirement of software licences and had not procured the required software wherever necessary.

(ii)   Passwords were changed monthly instead of fortnightly and special characters were not enforced.

(iii)   Audit trails and Audit Logs, though enabled, were not periodically reviewed.

On this being pointed out by Audit, the Management took necessary action to comply with the above guidelines.

7.6.3   The Internal Audit Manual stipulates that Information and System (IS) Audit is to be carried out by Internal Audit Department covering check of operating logs, control over backup data, input and processing controls, data security etc. A review of Internal Audit Reports did not evidence any such IS Audit conducted in line with manual instructions.

The Management stated (June 2004) that Audit was conducted covering various reports generated through computers on the related areas, viz., payrolls, purchases, stores, sales, assets verification etc., and exception reports were audited. The reply is not acceptable as data extraction is only a part of IS Audit. The main purpose of IS Audit is to assess the adequacy of controls in IT environment to ensure data accuracy, reliability and confidentiality.

7.6.4   It was observed that though the Company took backup of data on daily, weekly and monthly basis, in the of absence of version control number for backups, it was not able to furnish the Inventory data of earlier years as per financial statements. Hence, Audit was not able to assess the accuracy of data available in the system. Based on the Audit observation, the Company took action to take system level backup and also agreed to formulate, prepare and implement suitable institutionalised business continuity plan.

7.7   Conclusions

(i) The primary objective of implementation of IIS with particular emphasis on scalability and upgradeability was not achieved as the planning and execution of the IIS project was not effective.

(ii) The software that had been developed was primarily a transactional system with little support for online analysis or decision-making.

(iii) System documentation was lacking and consequently the upgradeability was low.

(iv) General and Application Controls operated in the IT environment in Bangalore Complex were not effective.

(v) There was high volume of manual intervention of data adjustments resulting in human errors.

(vi) Non-reconciliation and existence of discrepancies in data between MRP-II and IFAS existed which did not help in decision-making.

7.8   Recommendations

The Company should consider the introduction of ERP system which will take care of deficiencies mentioned above. The control environment needs to be made stronger including access and processing controls to ensure data integrity and security. The Company needs to formulate a proper institutionalised business continuity plan.

The review was issued to the Ministry in November 2004; its reply was awaited (March 2005).