MINISTRY OF PETROLEUM AND NATURAL GAS

CHAPTER: V

Hindustan Petroleum Corporation Limited

Inventory Management System in Enterprise Resource Planning Environment

Highlights

There was a delay in formulating business continuity plan, setting up of disaster recovery site and deployment of the equipment purchased for the purpose. This could cause serious disruption to the business.

(Para 5. 7.1)

The system had design deficiencies such as lack of referential integrity, customisation, input controls and validation checks leading to presentation of inaccurate status of transactions. Over-riding of input controls resulted in supplies worth Rs.60.10 crore to the customers beyond the credit limit.

(Para 5.7.2, 5.7.3 and 5.7.4)

Valuation of stock was being done in excel sheet and MIS reports were being generated in an external utility package, though the ERP system had features for these functions. This led to underutilisation and undermining the effectiveness of the system.

(Para 5.7.6)

5.1   Introduction

Hindustan Petroleum Corporation Limited (Company), with its operational infrastructure comprising of two refineries with 13 MMTPA[*] capacity, 80 Regional Offices, 20 Terminals, 35 LPG[*] Plants, 120 Depots and 8900 Retail Outlets, has a long history of computerisation starting from the early sixties. In 1997, the Company with the help of M/s. Andersen Consulting conducted a Business Process Re-engineering (BPR) study to prepare the organisation for the changes in the environment subsequent to the deregulation of the oil sector, dismantling of the Administered Pricing Mechanism (APM) regime, entry of private players in the oil sector, enhanced competition, evolution of the Information Technology (IT) architecture etc. M/s. Andersen Consulting also recommended and assisted in selecting JD Edwards One World Xe software (JD Edwards) for Enterprise Resource Planning (ERP) with the aim to provide:

(i)   Flexibility to adapt to changing needs;
(ii)   Adoption of industry best practices;

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[*] **Million Metric Tonnes per Annum**
[*] **Liquified Petroleum Gas**

(iii)   Availability of on-line, timely and accurate information for improved decision making;

(iv)   Improved integration across functions and processes with reduced data cycles, reduced internal reconciliation, improved external reconciliation;

(v)   Improved working capital management - inventory, credit control, cash flows; and

(vi)   Increased profitability.

5.2   Implementation

JD Edwards software with licences for all the modules[*] was procured in April 2000. The implementation was initiated under the Project "Parivartan" with a multifunctional team of 25 officers drawn from various functional departments of the Company. The job of conceptualisation and detailed designing, configuration, customisation, localisation, development and testing of Conference Room Prototype (CRP) for the complete business of the Company and rolling out the model across selected pilot locations in India was awarded to M/s. Cap Gemini Consulting India Private Limited, the consulting partner of JD Edwards. Thereafter, the Company was to implement the roll out to the rest of the organisation. JD Edward system was implemented in 14 Pilot locations from March to July 2003. M/s. Accel ICIM was engaged to provide consultancy in addition to the internal resources for the roll out in the rest of the locations of the Company. The roll out of this package was done first in locations one after another since August 2003 and later on in regional offices, marketing headquarters and the corporate headquarters. This went on for about three years and was completed in April 2006.

5.3   Audit Objective

Study of the ERP system in the area of Inventory Management in the Company with a view to assessing whether the targeted objectives envisaged at the proposal and implementation stage of ERP system were actually realised.

5.4   Scope of Audit

The audit was limited to the Inventory Module implemented in the JD Edwards package of the Company. The data generated in the JD Edwards system since implementation i.e. from the year 2003 along with the migrated data from the legacy system constituted the data for audit analysis. For the purpose of comprehending the business process at the locations, audit examined and reviewed the system functionality at three pilot locations of the Company viz. Vashi, Wadala and Mazagaon.

5.5   Audit Methodology

The study of the Inventory Management System in the ERP environment in the Company was conducted by adopting the following methods:

∗   Issue of questionnaire and eliciting the Management's response and clarifications;

∗   Discussion with the higher Management, field level officers, technical officers, and users of the ERP system at the grass-root level;

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[*] ***Sales and Distribution, Manufacturing, Procurement and Project, Finance and Human Resources***

∗ Study of the available features in the various sub-modules of the Inventory module;

∗ Analysis of data extracted with the help of Audit tools like IDEA[*] and MS Excel from the limited access provided to audit; and

∗ Issue of preliminary audit observations to the Management for response with a view to firming up the audit conclusions.

5.6 Limitations

Audit extracted and analysed the data from the JD Edwards system relating to Inventory module limited to the query screens in the application. The Management did not provide access to the following:

∗ Complete Data dump

∗ Testing with dummy data on the online production environment to test the input and process validation controls.

5.7 Audit Findings

5.7.1 Business continuity planning

As all sales are done online, the JD Edwards system became a mission critical application whose failure could cause serious disruption to the business of the organisation. Audit observed that the Company did not have a disaster recovery and business continuity plan till June 2005.

The Committee of Functional Directors had in principle approved Business Continuity Plan only in July 2005. However, neither the disaster recovery site was operational nor were the equipment purchased for improving the connectivity deployed (October 2006).

5.7.2 Design deficiencies

5.7.2.1 Lack of referential integrity

In a relational database system[*], data integrity is ensured with the help of referential integrity such that any changes in the data element have cascading effect on all the related tables in the entity. These controls form part of the system design and any weakness in these controls results in lack of data integrity. Audit analysis revealed cases of lack of referential integrity as below:

i. In 5009 items of purchase orders placed from Wadala location, 2170 from Mahul and 778 from Vashi, delivery of the items in the purchase orders was completed and updated in the General Ledger. However, these purchase orders were shown as open purchase orders implying that delivery against them was not complete. This indicated lack of referential integrity in the system.

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[*] *Interactive Data Extraction & Analysis (IDEA) is a software tool that aids in data extraction and analysis for audit purposes.*
[*] *A relational database is a set of relations that help to organise and structure the data, in addition to forcing the database to conform to a set of requirements as per business rules encoded in the system.*

ii. Scrutiny of the in-transit inventory in the JD Edwards system (valuing Rs.30.26 lakh) for the Mazagaon Lube location revealed that transactions pertaining to the period from March 2003 to December 2004 were shown as inventory in-transit. Further scrutiny at the locations revealed that these items had already been received in the receiving locations and were actually not in-transit indicating lack of referential integrity.

5.7.2.2 It was observed during audit at Sewri, Wadala, Vashi and Mazagaon locations and the Corporate Office that while querying, extracting and downloading the data the JD Edwards package provided poor navigation facilities resulting in heavy loss of time. The querying gave output of only a few records at a time on the screen and the user had to key in repeatedly for the next set of records. Audit observed this as an inherent design defect in the JD Edwards package inhibiting the system efficiency.

5.7.3 Deficiencies in customisation* of the ERP system

All excise forms were to be prepared through the ERP system. However, as the ERP system was not yet fully customised to the requirement of the Company, two forms were still being prepared manually and this data fed into the system subsequently. There were nine employees engaged in this job. The Management stated that the India localisation impact was an add-on to the standard ERP package. The Management's reply confirmed that even after three years of the project being implemented, the customisation of the package to cater to all types of excise forms was wanting.

5.7.4 Input controls and validation checks

Input controls ensure that the data received for processing are genuine, complete, accurate, properly authorised, entered promptly and without duplication. Validation checks ensure that the data conforms to the business rules. The input controls and validation checks, thus, ensure the correctness and completeness of the data.

5.7.4.1 Scrutiny of Item ledger report revealed that transactions which should have been recorded at current date, had future dates for years 2007, 2009, 2013, 2019.

The Management stated that the dates in transactions normally default as the current date. When transactions are entered in future date system provides warning to the user and these errors are due to the wrong entry and overriding of the warning by the users. These aspects of transactions accuracy were being stressed in all the training programs. The reply of the Management indicated that provision for overriding of the validation checks along with weak input controls did lead to feeding of erroneous data into the system.

5.7.4.2 The ERP system has built in controls to check credit sales and enforce relevant business policies to monitor the application of payment terms agreed with each of the Company's customers. Analysis of sample records of sales transactions with customers revealed that sales transactions had taken place in contravention of the business rules maintained in the system as explained below:

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* *Customisation involves reconfiguring and mapping the software package to the organisational needs.*

Sales Area	Payment Terms	Actual sales transaction
West Zone Retail Unit at 'Bandra' sales area	(i) Advance payment (ii) Credit period allowed in the range of three to 45 days	Supplies were made bypassing the "Advance payment" term in the system to the extent of Rs.20.92 crore as on 23/12/2005. Similarly, credit periods ranging from 60 days to 900 days were allowed.
Headquarters' Office customers under 'direct sales'	Advance payment	Sale on credit amounting to Rs.2.55 crore as on 13/01/06.
Headquarters' Office customers under 'direct sales'	Payment to be made monthly in advance	Sale on credit amounting to Rs.31.95 crore as on 13/01/06.
LPG bulk customers in the western region	Credit limits fixed	Supplies beyond the credit limit to the tune of Rs.1.69 crore (as per the accounts balance in 2005-06, taking into consideration both the ERP and the legacy balance against the particular party).
Vashi Sales Area	Credit limits fixed	Supplies beyond the credit limit to the tune of Rs.2.99 crore.

The above indicated that the validation checks built into the system that translated the business policies of the Company were allowed to be bypassed by local Management decisions. Though approvals were obtained manually, any reference to the authority for exceeding these credit limits was not available in the system. This indicated that the system was vulnerable to overriding of control on the credit limit.

The Management replied that in many cases the credit balances of customers were lying in legacy accounts since the collections had been made in the legacy system before the collecting location going live on ERP. In some of the other cases, the customers' accounts in JD Edwards system were under reconciliation. In some cases customers had more than one address number; one of the accounts had credit balance, which needed to be migrated to the other account.

The reply of the Management indicated lack of input controls while porting of data from the legacy systems rendering the data available in the system unreliable. Further, the rising figures of Sundry Debtors from 2003 to 2006 and supplies made beyond the credit limit to

the tune of Rs.60.10 crore as pointed out in the table above indicated that the Management's objective of improved working capital management through the ERP implementation was not achieved.

5.7.5   Internal controls

Internal controls within an organisation are designed to provide reasonable assurance regarding the achievement of reliability and integrity of information. Internal controls, thus, ensure completeness, timely updation, accuracy and validity of transactions leading to economic and efficient use of resources.

5.7.5.1 Scrutiny of the 'availability' of the items revealed that tank number TK5002 in location number 11213 was available for storage of inventory although the tank had been dismantled and decommissioned in April 2005. The database was not updated.

5.7.5.2 It was observed that no bank guarantee details were available in the system.

Thus, non updation of data in the system led to unreliable information being available and also indicated that the internal control mechanism was not effective in ensuring the completeness of data.

5.7.6   Underutilisation of inventory module of ERP

5.7.6.1 At the time of initial 'Go-live' at various locations, the available cost of inventory items was incorporated as standard cost* into the system. The Management maintained the same data over a period of three years and had not configured the system to update the costs and compute the value of stock. As per the current practice, various parameters required for computing the stock value were derived from the ERP system and were tabulated in an excel sheet and valuation was done on weighted average cost basis in the case of raw materials, lubes and crude oil, and at cost (FIFO* basis) or net realisable value, whichever is lower, for finished products. Although the ERP system had the capability to capture all the data relating to the stock valuation, the Management did not utilise the features by not designing the system to provide the value of the stock, thus undermining the effectiveness of the ERP system.

5.7.6.2 JD Edwards system had provisions for generating ready made reports viz. analytical and integrity reports*. However, these reports had not been configured in the Inventory module of ERP to generate the required MIS reports. This resulted in not-utilising this feature available in the system, dependence on external utility packages and dedicating manpower resources for this purpose which could have been used elsewhere.

5.8   Conclusion

The Company made an investment of Rs.109.85 crore in the ERP system with certain objectives to face the imminent changes in the competitive scenario. However, lack of

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* *Fixed cost not revised periodically*
* *First in First Out (FIFO), method used in recording the cost of inventory for stock valuation and inventory movements.*
* *Analytical reports like ABC Analysis report, Cost Analysis report, Margin Analysis report, Valuation Analysis report, Inventory Turnover report, Supply and Demand report etc. and Integrity reports like Item Balance/Ledger Integrity report, Ledger/Account Integrity report etc.*

complete customisation, lack of input controls and validation checks, deficiencies in the design and non utilisation of various features were noticed during audit. These led to incorrect data being fed into the system and underutilisation of the Inventory module in achieving the objectives of availability of on-line, timely and accurate information for improved decision making, improved working capital management and improved profitability and optimal deployment of human resources.

5.9   Recommendations

In order to exploit the full potential of the Inventory module of ERP, the Company should:

∗   Ensure that input controls and validation checks are built in and are applied to all data entered into the system. Even in case of porting of data from legacy systems, the data should conform to these controls;

∗   Ensure completion of customization of the Inventory module so that recourse to manual intervention is avoided;

∗   Ensure timely updation of various information into the system through prompt internal control mechanism;

∗   Address the design deficiencies; and

∗   Ensure that all the relevant features of the software are utilised.

The matter was reported to the Ministry in December 2006; reply was awaited (December 2006).