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IMPLEMENTATION OF SAP AT INDIAN OIL

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Abstract : “MANTHAN” the Enterprise Resource Planning solution executed through SAP (a software package) is adjudged as the best package to deal with the huge network of business of a company like Indian Oil Corporation which has achieved the status of “MAHARATNA” – (the precious super jewel) awarded by the Government of India. There are three such mega companies enjoying such status in the country.^[1] It also got a rank of 125 in the Fortune “Global 500” in 2010. This paper tries to scrutinize the loopholes that existed in the system and examines the modus operandi of SAP to address such problems.

1. INTRODUCTION

^[2,3]“MANTHAN” is the name assigned to the Enterprise Resource Planning of the Indian Oil Corporation (IOC). The IOC^[1] is one of the “MAHARATNA” Company, a status awarded by the Govt. of India. The status symbolizes the volume of business, the magnitude of profit, the amount of investment and the dimensions of transactions. The Corporation, a creation out of mergers of two big companies came into existence during 1964. The business interest of the Corporation include the entire hydrocarbon value chain from refining, pipeline transportation marketing of petroleum products to exploration and production of crude oil and gas, marketing of natural gas and petro-chemicals.

^[1]The strength of the company can be judged from the fact that it has a workforce of 34,000 with a turnover of Rs.271,074 Crore(\$ 600,851,158,15) and profits of Rs.10,221 Crore(\$ 22,655,4361). The Corporation account for over 48% petroleum products market share, 34.8% national refining capacity and 71% downstream sector pipelines capacity in India. It is proud of its retail dealers network numbering 18,463 across the country. With facilities at multiple locations(Sri Lanka to UAE) and ever expanding market opportunities, the IOC faces a daunting task in managing. During the survey of the company’s operations, some lacunae were identified which created bottlenecks for efficient management of resources. The roadblocks to the sustainable growth of this global Indian Company required be pinpointing and dealing with appropriately for a greater technical solution.

The Lacking Operational Legacy System: It was ascertained that lack of proper coordination and integration between different functions resulted in^[3,4]

- Sub-optimal production planning and scheduling
- Long manufacturing lead times
- Inefficient inventory lead times
- Low work center utilisation
- Follow up of work orders
- Errors in engineering and manufacturing records
- Quality problems
- Duplication of efforts
- Poor communication and inefficient result

Hence the ERP designed for encountering these shortcomings – is a fully integrated business management system covering Logistics(Materials, Production, Sales and Distribution, Plant Maintenance, Quality Management, Project Management, Production Planning, etc.) , Accounting(Finance and Controlling) and Human Resources, while at the same time, incorporating the industry specific solution and the best business practice worldwide.

Application of IT Reengineering: The Enterprise Resource Planning revolves around Business Process Re-engineering (BPR)^[2]. The BPR represents radical transition that every member of the company has to undergo. In the vast majority of cases, BPR is powered by information technology re-engineering. In order to align the IT Re-engineering- exercise with the business needs of Indian Oil, the Management conducted series of discussion and workshops. The Vision, Business Strategies and Critical Success Factors were arrived at after making SWOT Analysis of IOC from the perspective of Global Competition.

^[2]The “as-is” high level processes for these themes were studied and the business issues, relating to both IT and non-IT, were identified. Based on these, set of Target Applications for Indian Oil were framed which reflected the business activities, major interfaces and information flow. Target Applications are conceptual framework or map of the various work processes that occur in Indian Oil. This

coupled with Internationally Best Practices of ERP reflect the “to-be” scenario.

Solutions for the Target Applications: The important considerations that have impacted the recommendation of IT environment for the target applications are:^[11]

- 1) Communication connectivity across Indian Oil
- 2) Standard and accurate data
- 3) High Degree of reliability & security and,
- 4) Centralized control with decentralized customer response

It is evident from the list that the above issues are mainly related to building of enterprise networking infrastructure of Indian Oil. Elsewhere in the world, it has been proved that Enterprise Networking Infrastructure or Integrated Communication Network is the building block for any big companies, having substantially widespread activities like Indian Oil, to be successful in their business.

2. SAP and Its Application

^[1,2,11]As a software package of ERP , IOC preferred SAP over others. The SAP package comprise of SAP R/3(4.0 B), IS-OIL(4.0) and CIN(2.2 B). SAP R/3 stands for Systems, Applications and Products in Data Processing. The letter ‘R’ represents Real Time and the number ‘3’ indicates 3-tier architecture. IS-OIL(4.0) is the oil industry specific solution and CIN represents Country India Version of SAP R/3.^[6,7]

Pre-SAP Scenario	Post-SAP Scenario
Islands of inconsistent information	Integrated, consistent, concurrent information
Distributed information processing, data transfer from different locations & functions	Centralised information processing, on-line, real time updated information
Duplication of jobs due to lack of information and connectivity	Integrated information, data once entered updates all relevant records
Local processing	Remote processing, on central server

SAP Implementation - Major Activities: The following activities are inbuilt in the implementation of SAP. ^[8,9,10]

- Conceptual Design
- Detailed Design
- Construction
- Implementation
- Data Conversion

3-tier Architecture of SAP:^[6,7,8,9,10]

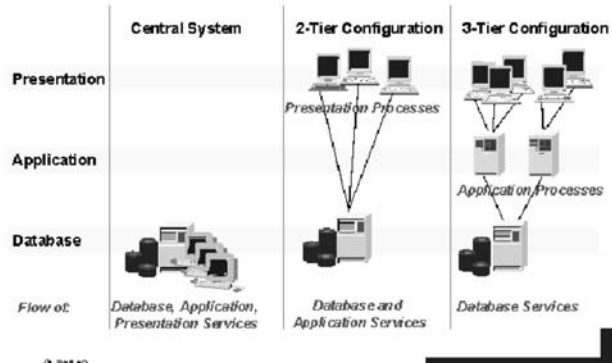
Presentation Layer : Typically installed on a PC, provides the SAP Graphical User Interface.

Application Layer : Executes the business logic, process client transactions, print jobs, running reports, co-ordinate access to the Database.

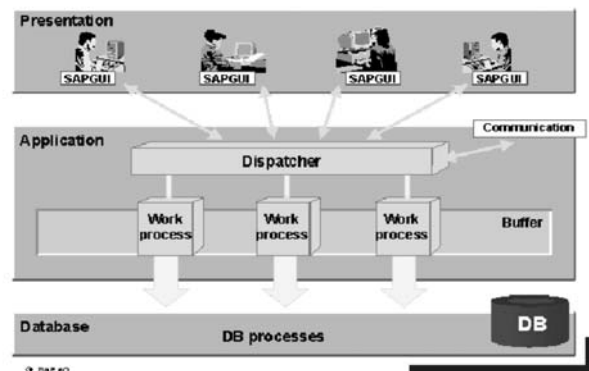
Database Layer : Stores both the business generated data and SAP application programs, which are loaded into application servers from the database at run-time.

^[2]SAP is implemented in the Company in a centralised and three layer architecture namely Database, Application and Presentation layers. The SAP system is having three servers *i.e.* Development Server, Quality Assurance Server and Production Server. The Company is using UNIX as its operating and application system, while Oracle has been used as RDBMS (Relational Database Management System) for managing its database. The Company has kept its Database and Application servers at the corporate data centre and they are accessible through leased line and/or very small aperture terminal from all state offices, refineries and pipeline units’ networks. Other units such as terminals, depots and bottling plants *etc.*, are connected to SAP through connectivity to the nearest State Office/Refinery.

R/3 Client/Server Configurations



Processing User Requests



3. SALES & DISTRIBUTION (SD)- Functionalities:^[11]

Functionalities:	
-	Quotation for sale to existing or prospective customers
-	Creation of Sales Orders
-	Other sales documents like Sales Contracts and Scheduling Agreements
-	Credit Management
-	Credit Control Areas
-	Delivery
-	Goods Issue (GI)
-	Billing or automated invoice creation
-	Creation of Excise Invoice
<i>SAP also handles product returns and document cancellation, keeping a complete audit trail of the activities.</i>	

DEFINING THE ORGANIZATION IN SAP:^[5,3,11]

The SAP structure comprises organisational units. These units are mapped to the existing IndianOil organisational entities in such a manner that the structure thus evolved will drive processing in the system so as to reflect the business environment of the Corporation. The organisational units of SAP and their relationship with the organisational entities in the existing enterprise structure of our Corporation are explained below:

The organisational entities in Indian Oil which have been defined as Company Codes in SAP are:^[1]

- Registered Office, Mumbai
- Marketing Division: Head Office, Regions & State Offices
- Refineries Division: Head Office and Refinery Units
- Pipelines Division: Head Office, Regional Offices, and all Pipeline Units
- R&D Centre
- AOD: AOD Marketing and Digboi Refinery
- Indian Oil Blending Ltd.

The organizational elements of the Sales & Distribution module are:

- Sales Organisation
- Distribution Channel
- Division
- Sales Office
- Sales Group
- Shipping Point

SD Application Module:^[11]

Sales and Distribution (SD): Designed to support all of the tasks and activities needed to carry out customer sales, order entry, delivery, and billing

Key Elements: Key elements of Sales and Distribution system are Pre-Sales Support, Sales, Shipping and Transportation, Billing, Credit and Risk Management,

Returns and Repair Processing, Foreign Trade, Sales Info System and

Sales and Distribution: The list of Organisation units being used in IOCL is as follows:

- *Sales Organisation*
- *Distribution Channel*
- *Division*
- *Sales Office*

Distribution Channel

CO	Consumer
RE	Retail
OM	OMC
EX	Exports
ST	Stock Transfer
MC	Miscellaneous
IO	IOCL – Inter Company

Division: In the SAP R/3 System you can define a division-specific sales organization. Product groups, i.e. divisions, can be defined for a wide-ranging spectrum of products. For every division you can make customer-specific agreements on, for example, partial deliveries, pricing and terms of payment. Within a division you can carry out statistical analyses or set up separate marketing. Few examples of Division are:

MS	Motor Spirit
HS	High Speed Diesel
SK	Superior Kerosene Oil
AV	Aviation
LU	Lubes
LP	LPG and Other Gases
PS	Petrochemicals and Specialties
HC	Hydrocarbon Products
AL	All Products for Inter Company
MC	Miscellaneous
SE	Services

Sales Office: All marketing offices of IOCL like Area Offices and Divisional Offices would be captured as Sales Offices in SAP. In addition, HO, RO, Refinery Units, Pipeline Units and R&D would also be represented in SAP as Sales Offices.

Sales Group: Revenue districts in Bulk and LPG would be represented as Sales Groups In Lubes geographical zones would be defined as Sales Groups. These Sales Groups would be assigned to respective Sales Offices.

Shipping Point: Each location of IOCL defined as a Plant in SAP would also be represented as a Shipping Point in SAP and would carry the same code. Thus there would be one Shipping Point attached to each Plant.

Credit Control Area: Credit Control area is the organizational unit in an organization that specifies and checks credit limits

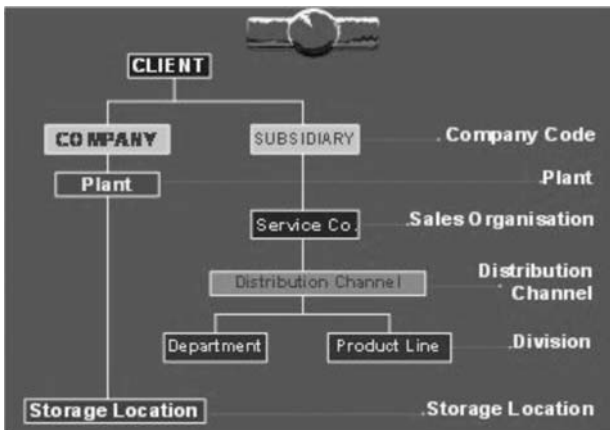
for customers. A credit control area can include one or more company codes.

In IOCL, there will be eight credit control areas defined for :-

- Lubes
- LPG
- MS & HSD
- SKO
- Aviation
- Speciality products
- Combined products
- Miscellaneous

This would enable credit monitoring and control for customers in each product category, as is the requirement in Indian Oil.

The relationship of the SAP organisational elements with each other and with the corresponding entities in IndianOil is illustrated in Figures 1.



A customer may have different production facilities, all drawing supplies from different plants of our company but requiring a single invoice to be sent to a central authority for payment. In such instances where different offices or individuals of a customer perform different functions, the following partner functions have been defined. However, the data relevant for each of these functions will be different.

- a) Sold-to Party
- b) Payer
- c) Ship-to Party
- d) Bill-to Party

While the customer is set up at the level of Sold-to Party and assigned a single customer code across the Corporation, multiple partner functions like Ship-to-Party (Shipping data); Payer (banking details);

Bill-to-party (billing schedules) can be assigned to the same Sold-to Party.

To sum up, SAP facilitates setting up of a multi-location customer centrally, with one customer code, multiple partner functions, and features specific to the product or geographic location applicable for different transactions in the appropriate sales area.

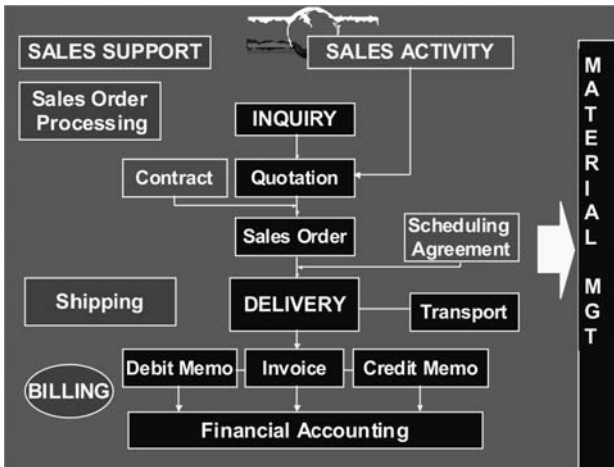
Customer as Vendor: A company may be both a customer and a vendor, as in the case of LPG distributors being transport contractors as well. In such cases, the integration between modules in the SAP system enables entry of the supplier/vendor number of the party in its Customer Master record and alternatively the customer number in its Vendor Master record. This helps in credit/debit adjustments of the party's transactions with our Corporation, if desired.

Other Master Data of relevance to the SD module that will be maintained centrally in the system is:

- **Customer Credit Master** for each customer. Customers can be assigned a maximum total credit limit or multiple individual credit limits, as may be required for those uplifting multiple products, each with a different credit limit.
- **Sales Tax and Local Levies Master** will be maintained centrally.
- **Additional Master Data** like discounts/surcharge for customers; material or customer/material combination is maintained in the system centrally.

SD Sub-Modules: The SD module comprises five sub-modules: Sales, Shipping, Transportation, Billing and Sales Information System. Elaborate authorisations and controls are being incorporated in the system to permit access to authorised users only in the respective sub-modules.

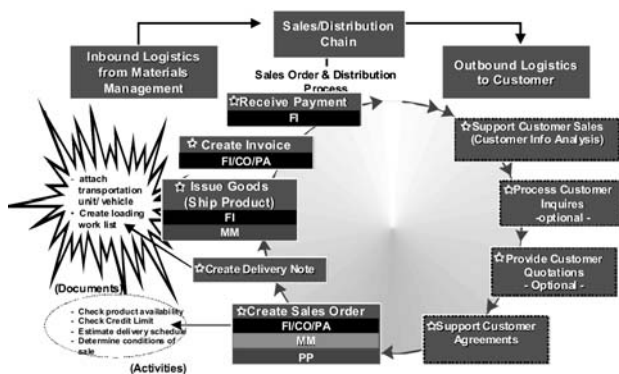
Figure 2: A bird’s eye view of the SD transactions



Each sales transaction does the following:

- It passes requirements to MRP (material requirement planning) during sales and delivery processing
- It updates inventory levels when goods are issued
- It automatically determines what G/L accounts to operate during finance-related transactions, goods issue, invoicing, etc.
- It passes information to other modules for profitability analysis, cash forecasting and managerial accounting.
- In a make-to-order environment, there is a direct link between SD and Production Planning.

Figure-3: A typical sales cycle, with implications in other modules



The above cycle illustrates the integrated solution provided by SAP to the S&D processing functions.

The sales application component enables you to implement various different business transactions for the sales documents that have been saved in the system.

There are four distinct groups of sales documents:

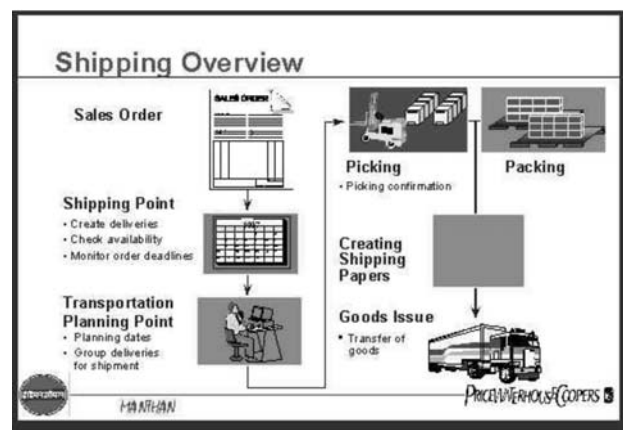
- Customer inquiries and quotations
- Sales orders
- Outline agreements, such as contracts and scheduling agreements
- Complaints, encompassing free of charge deliveries, credit /debit memo requests and returns

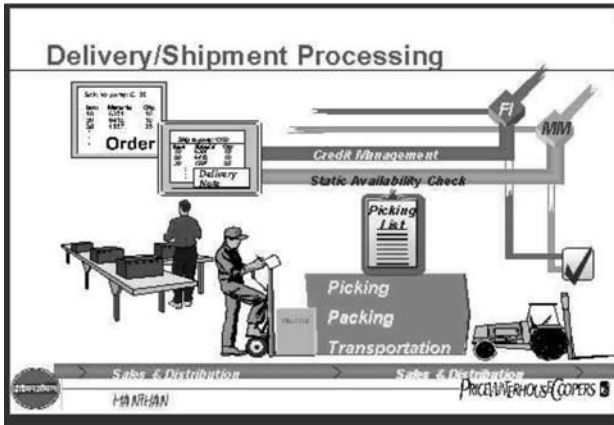
Basic Functions During Sales Order Processing

During sales order processing, the system can carry out, for example, the following basic functions:

- Monitoring the sales transactions
- Checking for availability
- Transferring requirements to materials planning (MRP)
- Scheduling the delivery
- Calculating pricing and taxes
- Checking credit limits
- Creating printed or electronically transmitted documents (confirmations, and so on)

Depending on how the system is configured, these functions may be completely automated or may also require some manual processing. The data that results from these basic functions (for example: shipping dates, confirmed quantities, prices and discounts) is stored in the sales document where it can be displayed and, in some cases, changed manually during subsequent processing.





The delivery is the central object of the shipping process. When the delivery is created, the shipping activities, such as picking or delivery scheduling, are initiated and monitored, and data that is generated during shipping processing is included in the delivery.

You can - depending on your requirements - create deliveries automatically using worklists or manually. You can make agreements with your customers regarding full or partial deliveries or you can combine different orders together.

Overviews enable you to monitor the created deliveries and also the shipping activities that need to be undertaken.

The aim of the new transportation feature in the Sales and Distribution application component is to provide basic functions for:

- Planning and processing transportation
- Calculating freight
- Settling freight transactions
- Calculating customer freight
- Invoicing customer freight
- Selecting service agents

These new transportation functions handle planning and processing for both inbound and outbound shipments. You can control and monitor the entire transportation process from the planning stage, to goods issue at your shipping point (for outbound shipments) or vendor location (for inbound shipments), through to goods receipt at the customer location or your plant.

Four basic modes of transport are considered

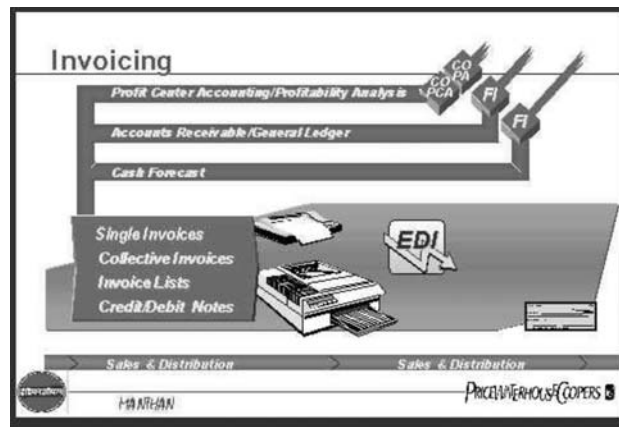
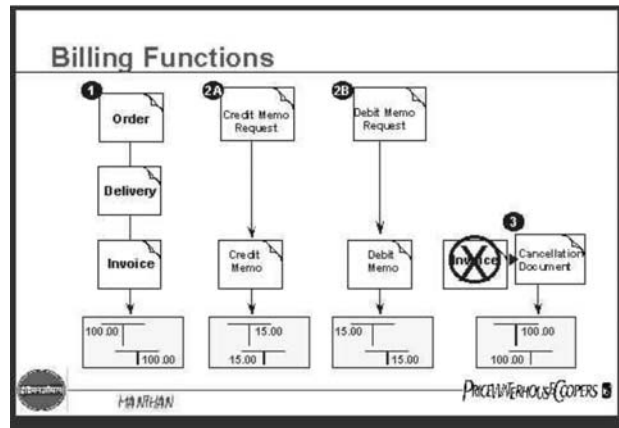
- Transport by Road
- Transport by Rail
- Transport by Sea (Ship / Barges)
- Transport by Pipelines

Billing is the last process in Sales and Distribution.

Using SAP R/3 4.0 B you can:^[11,6]

- Issue invoices on the basis of goods and services

- Issue credit and debit memos
- Issue proforma invoices
- Cancel billing transactions
- Issue rebates
- Transfer billing data to Financial Accounting (FI)



Availability check and requirements in SD processing enables end user to know online about the product availability , production schedules etc. SAP implementation team is considering of building an interface between TAS (Terminal Automation System) and SAP to get online information about product availability , so that full potential of this feature can be availed by IndianOil systems.

Plant - A plant has an address, a language and belongs to a country. A plant also has its own material master data.

In IOCL, there are two categories of plants: ^[1]

- **Physical plants** - Refinery units ; Pipeline units ; Lube blending plants ; Small can filling plants ; Central inventory points ; CFA agents ; Bottling plants ; Aviation Fuel Stations ; Terminals; Depots; R&D Center ; IOBL ; AOD Refinery ; AOD Marketing

- **Logical plants**, wherein the physical location is not of IOCL but the consignment ownership is that of IOCL.Examples :

Refinery Division - High Sea (for Crude);Discharge port (for Crude) ;

Marketing Division - High Sea (for Products) ;

Discharge Ports (for Products);

In SAP, plants are assigned to company codes. A plant can belong to only one company code.

Purchasing Organisation:

(1) Hydrocarbon Purchasing Organization

(2) Non - Hydrocarbon Purchasing Organization

(3) Services Purchasing Organization

Each of the above purchasing organizations will be ‘floating’ in nature.At the time of transactions, company codes will be determined through plants.

Hydrocarbon Purchasing Organization	All plants except those belonging to Pipeline Division Company Codes.
Non - Hydrocarbon Purchasing Organization	All plants
Services Purchasing Organization	All plants

Purchasing Group:

A purchasing organization is subdivided into purchasing groups, which are responsible for certain day-to-day purchasing activities.

^[1,11]This article deals with the functionalities offered by SAP’s Sales and Distribution Module. Therefore, it is a recommended reading for employees of different organizations who operate in Sales and Operations and those who will be the end-users of this functionality module of SAP. The integration of all modules in SAP R/3 – and SD, MM and Finance(FI) modules in particular – provides online, real-time information regarding the status of sales order, customer payments(credit/debit) and product despatches, to name a few, to the marketing team. At the same time, the system facilitates service departments to achieve greater productivity through online transactions, documentation and data archiving.

5. Conclusion

^[11]Communication is the buzzword of today’s world. For any enterprise to get success in its’ own arena, it has to

make its communication infrastructure strong. It is truer for organization like Indian Oil who has already implemented across the board the solutions of Enterprise Resource Planning. The theme of ERP is integration and standardization of business processes, which in turn, results in more benefits for the organization. The act of integration along with the sharing of information demands for an enterprise networking solution^[5,6,7]

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