MIS Implementation at Construction Project: An Experience

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Abstract

Information systems serve as a critical medium in many industries, providing management with information necessary to make and support decisions. This MIS implementation study is conducted at Hydro Electric Turnkey Project by a leading project construction company in India i.e. 'LAJ' (Name not disclosed as requested). The project includes complete study and understanding of MIS implementation and various modules of the software that were implemented and used in the company. LI from Germany are the project consultants and the engineer in charge for the project. To implement the project LAJ had over 6000 employees working at the site. To co-ordinate all the functions the LAJ has implemented Management Information System (MIS) resulting into ease of working on the project. This paper gives a detailed understanding of all the modules of the MIS and how each module works and produces results for the company. The dependence of modules for particular information is also explained. This implementation is first of its kind in project construction in India. Data collection for the project was done through interviews with the project executives at construction site of power project. The secondary data was collected from website of the construction company.

Key Words : Business Process, Optimised Resource Planning, Trip Card

Company

LAJ is an acknowledged leader in the construction of multi-purpose river valley and hydro power projects and has been involved in construction of major engineering projects for the last four decades, including complex hydro power / river valley projects, expressways and real estate development, etc involving design and engineering of works, controlled earth / rock fill, concrete manufacture and placement (including

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chilling), fabrication and erection of penstock liners and steel structures, hydro-mechanical equipment design, procurement and erection, expressway construction and real estate development. Over the years LAJ has completed several projects in India and abroad as an engineering procurement and construction (EPC) contractor and possesses necessary experience and expertise to carry out such works in a time bound schedule. LAJ's current revenue is Rs 0.5 bn pa.

Hydro Electric Project

Hydro electric project in Northern India is executed with the help of three companies i.e. LI Germany as the consultant of the design, supervision, quality control and the Engineer-in-charge for the complete project; LAJ as civil and hydro mechanical works contractor and Voith Siemens as electrical and electro-mechanical works contractor for the project. The total cost of the project is estimated at Rs 4000 crores, while LAJ has awarded with civil contract of Rs. 2500 crores. LAJ has over 6000 employees working on this project alone and a complete base camp has been setup in the hills, which includes all facilities like staying, mess, hospitals and other amenities. Staff assigned to the project has been grouped under the headings such as project and site management, design review group, planning and control group, construction supervision team, and environmental monitoring group and administration staff

MIS Overview

A management information system may be defined as "a system that collects and processes data (information) and provides it to managers at all levels that use it for decision making, planning, program implementation, and control." An information system is comprised of all the components that collect, manipulate, and disseminate data or information. It usually includes hardware, software, people, communications systems such as telephone lines, and the data itself. The activities involved include inputting data, processing of data into information, storage of data and information, and the production of outputs such as management reports.

As an area of study, it is commonly referred to as information technology management. The study of information systems is usually a commerce and business administration discipline, and frequently involves software engineering, but also distinguishes itself by concentrating on the integration of computer systems with the aims of the organization. MIS has the following role to play:

* *Functional Support Role*

The business processes and operations support function are the most basic. It involves collecting, recording, storing, and basic processing of data. Information systems support business processes and operations in the areas of HRM, Production, Marketing, Finance, R & D etc

* *Communication Decision Support System Role*

Information systems can support a company's competitive positioning at various levels of analysis. It supports in piloting the chain of internal value. They are the most recent and the most pragmatic systems within the reach of the manager. They are the solutions to reductions of costs and management of performance. They are typically named 'Business Workflow Analysis' (BWA) or 'Business Management' Systems.

All successful companies have one (or two) business functions that they do better than the competition. These are called core competencies. However, in today's changing and competitive world, no advantage can be sustained in the long run. The only truly sustainable competitive advantage is to build an organization that is so alert and so agile that it will always be able to find an advantage, no matter what changes occur. Hence, communication is the key element in building competitiveness.

Information systems often support and occasionally constitute these competitive advantages. The rapid changes forced business firms to acquire timely and current information, which is critical for gaining competitiveness. In many cases the information system itself is the competitive advantage. Examples are Wal-Mart, Dell Computer, eBay and Amazon.com etc

Problem Faced in LAJ

In LAJ's previous projects all works carried out were manual or on paper hence most of the calculations were made on judgments. The main problem was that the data was not complete and not up to date. Hence this posed a problem for the top management to see if all the wings of the company were working properly or not and it was very difficult to analyze which activity or which part of the project was making profit and which part was going into losses. Benchmarking was also very difficult as there was no standardization set for any of the projects.

The total cost of the project was also difficult to calculate and tender filling was also became a problem. Hence, LAJ was one of the earlier construction companies in India to implement the MIS system to run on the complete network. LAJ also increased its capacity as well as allocated resources including

manpower, money, machines (systems) and material so that the costing and working can be computerized and all benefits of MIS explained earlier can be extracted.

Hardware

The complete networking of the LAJ at all its locations throughout India are done Via the INSAT 3A satellite and on radio frequency only. Base camp setup includes 85 terminals and connections at the base camp, project site and Stores.
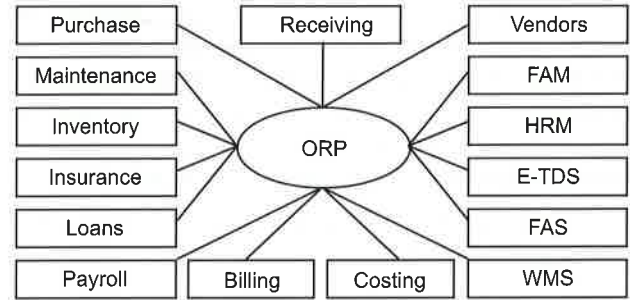

Figure I : ORP System

Hub: - 10 Mbps Terminals: - 85 at base camp Modems • Traffic • Supervisor • Data Card • Voice Card	Servers • UNIX and FOXPRO • Win 2000 Server and ORACLE 8i as back end and VB 6 as front end.	Cables:- • Over 100m – fiber cables • Less than 100m – CAT 6 cables.	Video Conferencing with • Polycom cameras • Data link @ 64 Kbps • Voice link @ 8 Kbps • Video Link @ 384 Kbps

The complete networking is done over 22 locations in India out of which 9 locations have video connectivity and others have only voice and data connectivity.

The main challenges faced by the IT dept of the company were

· Centralization

· Common coding for all softwares and activities

· Expertise to operate MIS

· Speed of the connectivity.

· Bandwidth related issues.

For internal connectivity the company already has a CITRIX server at the main head office in Delhi and all employees are given access through the LOTUS NOTES VER R5 and 6.0.

Optimised Resource Planning

The company has installed ORP system for information collection, processing and dissemination. The ORP (Optimized Resource Planning) is implemented on the basis of a software developed by MAARS Software Ltd. and is called MAARSMAN1 Ver 6.0. LAJ has already brought the software and further developments and changes required in the software for complete operations is done by the development team at the main centre HO in UP. The software completely covers all the individual operation that is a part of the ORP.

The diagram above shows all the modules of the ORP and Maarsman1, which the company has been using for optimum utilization of the resources. Benchmarking is not possible in ORP as it is the first time a construction company in India has implemented MIS in its processes and hence set the benchmark for new entrants.

Working guideline of the ORP system-

Following categories of bills are being received and processed by the functional users-

♦ Indigenous goods

♦ Imported goods

♦ Expenses.

♦ Capital goods.

♦ Material supplied by the Department (at Sites)

Except for the bills pertaining to supplies made by the department and the bill for expenses, processing under ORP is based upon Goods Receipt Note (GRN), being created by Stores at the time of receipt of material. The work flow for procurement of material and for processing of Party's bills is interrelated and has been defined as under :
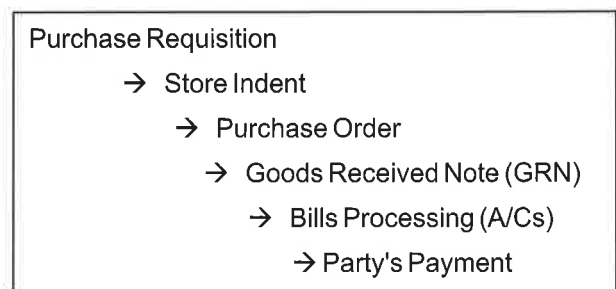
Purchase Requisition
→ Store Indent
→ Purchase Order
→ Goods Received Note (GRN)
→ Bills Processing (A/Cs)
→ Party's Payment

Figure II : Interrelation of Work Flow for Procurement and Processing of Bills

As is evident from above, due care and diligence is required while raising a Purchase Order under ORP since any mistake in the P0 does percolate down to bill processing and to the Party's A/e in the Books. Functional users' are therefore once again reminded to adhere to following practices while working with ORP.

◆ Ensure that the Purchase Order is thoroughly checked before approval.

◆ Amend the P.O (before receipt of material by Site stores) for any subsequent Change

◆ In terms and conditions (including rate etc.) negotiated with the Supplier

◆ Ensure all dispatches from H.0 bear ORP - P. 0. references so as to facilitate preparation of GRN at Site.

Sites also need to ensure

◆ that only one GRN is raised against one Invoice Challan of the Party. The current system does not permit linkage of multiple bills to single GRN. As such its absolute essential that GRN is prepared by the site stores individually for each Invoice! Challan. However, vice versa does not hold well i.e. there can be multiple GRNs against single Invoice / Challan. It has been noticed in the past that in order to clear the backlog of data entry, many of the Sites had resorted to creation of single GRN against multiple invoices, for which Accounts Dept. had to face lot of problems while processing the bills.

◆ that copy of discrepancy voucher / rejection voucher is sent to the Party. In case material has been received directly from the Party & to the H.O despatch section if the material has been received thru' H.O. No separate debit/credit note is required to be raised at this stage since GRN is recorded for the net quantity actually received by the Stores. H.O - dispatch section will in turn inform the Party about the discrepancy/rejection as advised by the Site stores.

◆ that the correctness of data entered in the GRN before saving the GRN (system provides adequate warning at each stage to this effect) since receipt is immediately recorded in the Stock Ledger and books of A/C, once the GRN is saved by the functional user.

◆ that All GRN's are checked and initialed by the concerned officials after comparison with Party's Invoice/Challan. In exceptional cases where the error still persist, Site store will have to create a Purchase Return Voucher with the option "Reinstate P.O" whereby a store return entry would be effected in the Stock ledger and P. O will get reinstated enabling the user to make a fresh GRN.

◆ that no change is incorporated manually in the GRN since bill passing is system based and system and does not take cognizance of any manual correction in the data entry.

◆ that copy of Journal Vouchers so generated duly initialed by the store in charge are sent to accounts Department at the end of the day. The GRN shall be the supporting documents for the journal Vouchers.

Party's Bill Processing

On receipt of the Party's invoice, a preliminary checking is carried out at Stores and Invoice should then sent to Accounts Department for processing, with GRN No, thereupon, they should also verify the levies (if any) not specifically mentioned in the P.O. like freight expenses, insurance charges etc. while forwarding the bills to accounts department should use "Bill Passing Screen" for processing all invoice except for imported material, department supplies, expense related bills and bills pertaining to previous financial year which shall be passed through the Journal Voucher.

◆ *Procedure for Processing of Purchases Made by the Imprest A/C's*

Following procedure is followed for accounting of the Imprest related purchases made by H.O on behalf of Sites:

◆ **H. O. -Accounts**

   - Debit Staff Imprest a/c (Individual a/c) on payment of Imprest.

   - On submission of Purchase Cash Memos, Debit respective site account with

   corresponding credit to the concerned staff (Imprest a/c).

◆ **Site(s) Purchase / Stores**

   - Raise a cash P.O. (if not already raised) for the material procured.

   - Choose the Vendor's name as "Misc. Cash Purchase" while raising the P.O. (For all

  - Imprest related purchases; Cash P.O has to be raised by the Site only. Incase

   Site has already sent an indent and H.O -Purchase decides to procure the material

   in Cash, it would be treated as normal purchase with 'Cash' as mode of payment.

   - Prepare the GRN at Stores for the material received.

◆ **Site(s) -Accounts**

   - On receipt of advice from H. O, choose 'Inter Site

processing' screen and debit "SL

- A/c: Misc. Cash Purchase" with Corresponding credit (automated) to H.O. a/c.

- simultaneously, process the PJV whereby O/s Liability is automatically debited with

- corresponding credit to "SL O/c: Misc.Cash Purchase".

Vendor Management Module

The complete purchase of materials and equipments is done through various vendors across the country. LAJ has a total of 638 suppliers of various products and equipments and for every vendor a separate code is generated. The vendor codes range from AG00003 to ZG00010. Any new vendor who is to be added or any old vendor who is to be deleted from the list can be done at individual site as well as the main head quarters.

Terms of payments to the vendors varies vary depending on the relations with the vendors. 90% of the vendors transact on credit basis and payments are made within a period of 45 days. Some of the vendors supplying high quality or huge amounts are paid at spot or even before receiving the goods, for ex: - SAIL for steel and IOC for petrol, diesel are paid earlier even before the material reaches the premises at the base camp. The most of the material that is brought in to project site is procured from the main 9 sites located all over India and those are; Local sites, head quarters (Delhi), other sites, imports (from foreign countries), Mumbai, Calcutta, Siligudi, Dulhasti (another LAJ project and main store), surplus Inventory at other sites of LAJ projects

◆ Purchasing

The complete purchasing of equipment is done from all the above said vendors and the system is fully computerized now. Hence all entries of the minutest details have to be entered into the system so that final costing can be made. The complete procedure starting from the purchase requisition to the final purchase order approval can be done with the help of MAARSMAN1. which is user friendly. The transactions such as; Purchase Requisition, Purchase Requisition approval, Store Indent, Store Indent approval, Purchase Order and Purchase Order approval etc.can be easily made and data of these forms can be entered into the system without any problems or issues.

◆ Reports

Reports such as; Purchase Requisition approval sheet, Store Indent, Indent Status reports (to check if material received), Enquiry and Negotiations can be generated daily, monthly or quarterly with the help of

MAARSMAN1 and can be used for analysis of the material procured and consumed for production, Rate Variation analysis, Amendments, Cancellations, Manifests, Vendor Analysis and Receipt Statements GRN wise. Hence all these reports are read by the senior officials of the company and detailed analysis made are forwarded to the top management for further decision-making.

◆ Receiving

Once the material purchase request is put up, the vendors send the material at the main store at the base camp. When the truckload of material reaches the main store and quality inspection is done and through then the data is to be entered for the material received. It includes the complete entries of the gate pass, goods received note etc. The various transactions that can be recorded using the MAARSMAN1 are: GRN Entry, Imported GRN entry, Material Replacement, Order Schedule and Gate entry which is very important for security purposes.

The main quality check i.e. "is the goods send are up to the set standards of the company at which they were demanded from the vendors?" is also done at the receiving level.

Also in Goods Receiving certain reports are generated for analysis and can be done for any time period required by the company. The various others reports generated are; GRN Report, Import GRN report, Gate Pass register, Discrepancy Vouchers, Rejected Vouchers, Intimation Slip, Receipt Statements (Supplier wise & Group head wise). System could sent Goods Received Note (4 copies) each to Supplier, Stores, Accounts division and Receiving Section

Inventory Management Module

The main central store is located at the base camp and LAJ has over 14 sub stores located in the area of operation. All the operations in the store including procurement, inventory management and receiving are fully computerized and MIS is implemented here and fully functional. The main inventory at the central store is actually divided into 17 major heads for e.g.: -

- 001 – all steel items
- 002 – general items
- 003 – Electrical items
- 004 – lubricants
- ----
- 017 – Assets (heavy machinery including tippers, bull dozers etc.)

All the items in the store are characterized by a 10 digit

universal code that is used everywhere throughout all LAJ sites. The code is as follows: -

1409E01502   - WATER FILTER (Aquafina , 20 ltr. black colour)

The first four digits of the code are meant for the minor heads and then the details of the product follow further on. In inventory management the basic two transactions done are Store Issues and Material return note.

Other REPORTS that can be generated in inventory management are: Debit Note Voucher, Issue voucher, Daily Issue statements, Inventory on loan, Site monthly requirements reports, Stock ledger, Stock transfer, Stock more than maximum level reports, Stock less that minimum level reports and Inventory statements

In totality inventory management module helps the company to reduce the wastage and improve the availability of the raw material to the production sites. It also helps to co-ordinate the purchase, receiving and inventory departments of the company so that it is easy to understand the need and requirements of various employees and increase the productivity.

Human Resource Management (HRM) Module

HRM control is exercised from the main head office in New Delhi and Technology Centre of LAJ. For the project site, the total manpower of 900 employees has been posted for the complete execution of the project. Also the company further has contracts with various contractors in areas of different projects so that the supply of labour and workers is easy. The other types of workers are DWC Daily Wages Cadre (around 1000 in number including employees) and SWC-Staff Wages Cadre (around 5000 in number including workers and labour). The HRM module in the ORP could do the transactions such as Manpower planning, Recruitment selection Joining order, Joining order formalities, List of various, Salary and wages breakups, Reimbursements, Performance appraisals and Details of the current employees.

The module also takes care of the leaves throughout of the year in which around 45 are defined for a year and other leaves are entered as per requirements. This application is done by a LEAVE MASTER in the Maarsman1 software and is a very user-friendly application. Other different information like salary structures that are made site wise can also be done depending on which site the employee is currently located at. Also some of the deductions are preset that will take place by themselves at the start of the month and variable deductions are done as and when the

facilities are used by the employees. For ex: - any employee who uses the mess facilities in the base camp can get his charges deducted by entering the number of meals he has had in the ORP and deductions of charges can be made directly. The ERP that is installed for Human Resource Management in JPA helps the HR employees to ease their operations and reduce paper work. It also reduces the time of operations and transactions in the company resulting into better productivity.

* ***Payroll***

The payroll of the company actually consists of the complete functioning of the HRM (employees) as well as the complete functioning of payroll (salary structure). The deductions are predefined in the HRM but there are other deductions that take place every month and they are handled in PAYROLL of the ORP. There are various transactions taking place in the PAYROLL module and they are; Shift Grouping, Shift Process , Leave Entry, Leave Cancellation, Loan and Advances, Attendance Confirmation, Attendance process, Attendance approvals, Mess Entry and Number of meals taken and Over Time

Earlier the company was using FOXPRO to enter the data of the employees and handling became very complex. There was very less security measures in the FOXPRO and no probable centralization took place. With the shift to ORP the benefits achieved are of high value as there is centralization and better security of data. The module is also capable of generating various reports that are used by the top management and the HR dept. to analyze the working and productivity of there employees. The reports that can be generated are; Shift Reports, Attendance Reports, Leave Reports, Joining Reports, Over Time Reports, Salary Reports, PF Reports, ESI Reports and TDS Reports

* ***Billing***

The genesis of the ORP at LAJ dates back to year 2003. Significant progress has been made since then in terms of Users Requirement Study (URS), Customization and roll out of all major business applications viz Purchase, Receiving, Inventory , Financial Accounting System (FAS) , Fixed Asset Management (FAM) & Payroll Processing. Today all transaction for these business processes are being carried thru ORP System at all site of the company. The development of billing (Client / PRW) module is an addition to the existing modules of the ORP System. The module primarily aims to raise work bill on client, based upon certified quantities of the measurement (MBS). Besides, system would also maintain track of payment received and recoveries made by the Client / Project Authority.
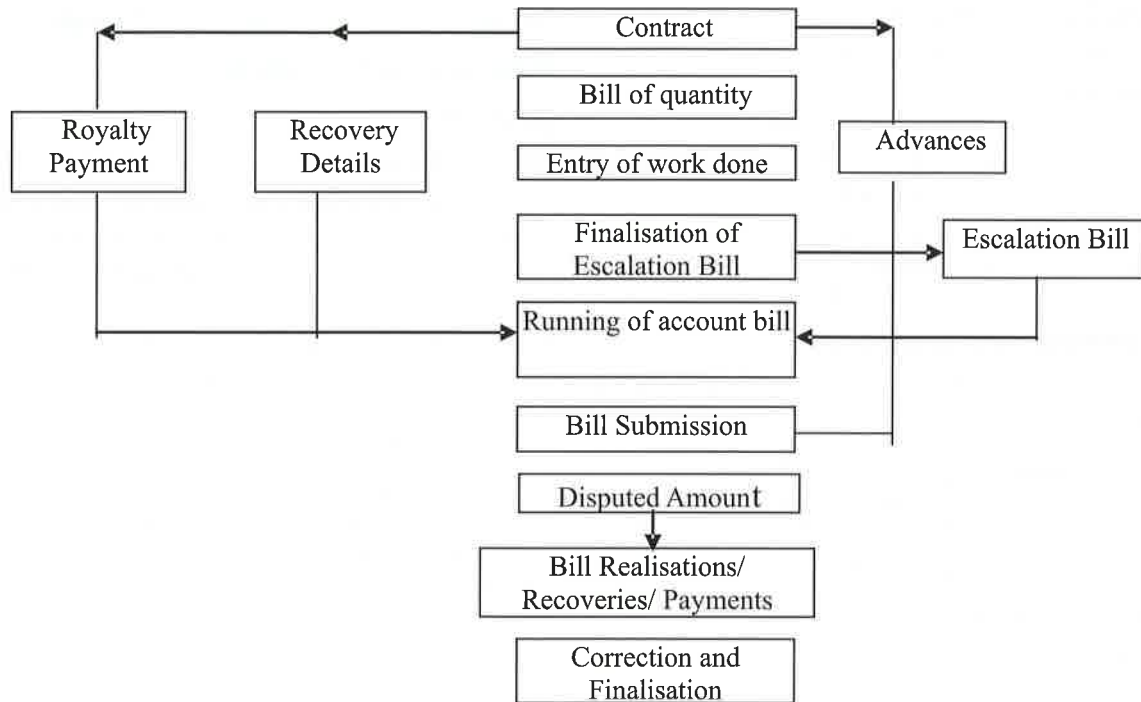
Figure III : Client Billing Module: - Work Flow

Codification Structure

♦ *Contract Code*

Contract code is system generated single digit numeric code signifying the number of contracts for work. Contract code is used to separate transactions where more than one contract exists.

♦ *BOQ Item Codification*

An alphanumeric five-digit codification structure has been designed for BOQ items for systematic and purposeful billing transactions. Besides, two sub levels also can be defined in 2 digit numerical numbers if needed. The structure would facilitate easy compilation of data.

♦ *Group Code*

Group Code is a two digit manual serial code to tag the BOQ items with the main group.

Example: - Open Excavation, Under Ground Excavation and Structural Steel Support

♦ *Sub Group Code*

The Sub Group Code is a two digit manual serial code to tag the BOQ items with the main group and the sub group. Example: -

Billing Group	Sub-group
01 – Open excavation	01 - Common excavation

♦ *Escalation Component Code*

Escalation Component Code is the 10-digit user defined manual code. It is required to capture the required details of the escalation component. Example: -

Code	Description
CPI_GEN	Labor
WPI_MAT	Material
WPI_POL	P.O.L
WPI_STL	Steel

♦ *Advances, Recovery and Reimbursement Code*

These are numerical two-digit system generated serial codes.Example:-

Type	Code	Description
Advance	01	Mobilization Advance
Advance	02	Machinery Advance
Recovery	01	Recovery of Mobilization Advance
Recovery	02	Sales Tax
Recovery	03	Retention Money
Recovery	04	Income Tax

◆ *Royalty Component Code*

This is numerical two-digit system generated serial code. Example:-

Code	Description
01	SAND
02	Aggregate
03	Boulder

◆ *DPR Group and sub group code*

This is also a two-digit system generated serial code.Example:

Group		Sub-group	
Code	Description	Code	Description
01	Underground Excavation	01	U/G excavation in flushing tunnel
02	Concreting		
03	Structural Steel Supports		

◆ *R.A. Bill number*

This is a numerically four-digit system generated serial number.

Example:- 0157   ----   (RA Bill 157)

◆ *Escalation bill number*

This is also a numerical four-digit system generated serial number.
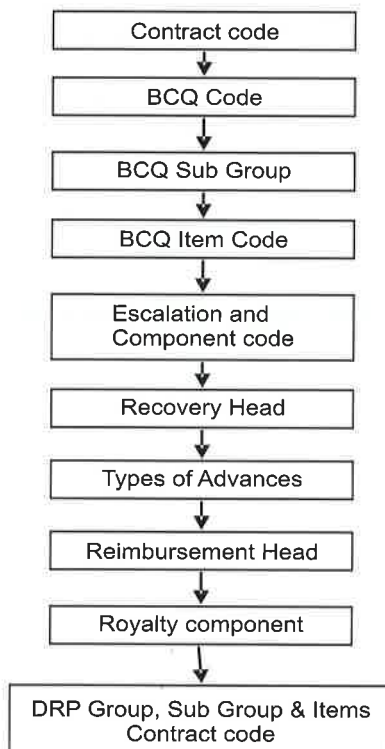
Example:- 0046   ----   (Escalation Bill 46)

Contract code
↓
BCQ Code
↓
BCQ Sub Group
↓
BCQ Item Code
↓
Escalation and Component code
↓
Recovery Head
↓
Types of Advances
↓
Reimbursement Head
↓
Royalty component
↓
DRP Group, Sub Group & Items Contract code

Figure IV : Billing System Coding Sequence Flow

Masters, Transaction Screens and Reports Generation

MASTERS

Work Contract

• Contract Profile Master - used for capturing all the details related to a contract like Contract Number, Name of work, Date of start, date of completion, project owner, billing currencies etc.

• BOQ Type Master- used for capturing the type of work in a contract like Civil work, Design engineering, Supply of hydro mechanical equipments etc.

• Bill Part Master - used for entering the parts of BOQ, which are being reflected in RA Bill like PART - A DAM WORK, PART -B Power House Complex etc.

• Bill Group Master- used to enter the main group of the BOQ item

• Bill Sub Group Master - used for entering the sub group of the BOQ items.

• BOQ Entry Master - used for the entry of the BOQ items of the contract. All details related to the BOQ items are being captured like the Item Description, part of the item (bill part), unit of the item, rate of item, finished quantity (closing balance), whether royalty applicable etc. authorized user can add new BOQ items or can change the existing items.

• Work location tagging with the BOQ items- Master is used for tagging the BOQ items with billing locations. Location is used for RA Bill preparation. Location wise Quantity for each item is entered for the billing cycle.

Escalation

• Common Escalation Component -Master is used for defining the escalation component, which is being used in escalation bill, like Labour, P.O.L, and Material etc.

• Escalation Component Tagging -Master is used for Tagging of escalation component with project contract

• Escalation Indices Transaction Entry -Master is used for entry I updation of monthly indices of escalation components

Advances, recovery and reimbursements

• Advance types: - Master is used to define various types of advances like Mobilization advance, Machinery advance etc.

• Recovery Heads: - Master is used for defining

various recoveries related to a bill and their parameters.

- Reimbursements: - Master is used for defining reimbursement heads under a contract.

DPR

- DPR Group Heads - Master is used for defining the Major Groups of DPR

- DPR Sub Group Heads - Master is used for defining the Sub Groups of DPR under Main Group.

- DPR Items Entry - Master is used for defining the DPR items, which is being used to prepare DPR day wise entry and report.

- BOQ Items tagging with DPR -Master is used to tag DPR items with BOQ items.

Royalty

- Royalty Components - Master is used for defining the components of royalty and their rates for computation of royalty.

- Royalty Tagging with BOQ Items - This master is used to tag royalty component with BOQ items and their composition for the various royalty component.

Transactions

DPR (Daily progress Report Entry)

This screen is used for DPR entry at various billing locations. Same transaction is used to print the DPR for that day.

Entry of work done - Location wise

This screen used to enter the quantity of each item for billing period at particular location. These transactions are being further used for preparation of RA Bill. Options available are:

- Create -Through this screen user can add location and item wise qty for the period of work done.

- Change - This screen is used to changes the qty of exiting items for word done period. If any item left out, the same can also be added.

- View - User can view the entry of work done for the selected period through this screen

R.A. Bill

- Process - This screen is used to prepare R.A Bill. System generates R.A Bill according to the defined parameters for the selected period of billing.

- View - This screen is used to view RA bill details on screen. Item wise remarks can also be updated if needed.

- Approval - Status of RA Bill is updated through this screen. For example Initial Bill can be changed to Authorized. Or Authorized bill can be updated as submitted. Like wise bill status can be updated as 'Corrected or Finalized' (Completed).

- Withheld - This screen is used to capture the item-wise withheld payment transactions.

Escalation Bill

- Processing Provisional Bill- This screen is used to prepare provisional escalation bill. Escalation bill is generated based on the given parameters by user.

- Approval -This screen is used to approve or change the status of escalation bill.

- Final Bill Processing - This screen is used to prepare the final escalation bill. System will check for the available indices for the period given by user and create escalation bill accordingly.

Advance Bill

This screen is used to capture the amount of advance taken. Details related to advance bills are also further used for recoveries of advance from RA Bills.

Recovery Transactions

- Change Before bill submission

This screen is used to change the recovery details of R.A Bill if any changes are to be made in bill before submission.

- Change after bill submission

This screen is used to change the recovery details of R.A Bill if any changes are to be made after submission of bill i.e. in Corrected bill.

Reimbursement Bill

- Create- This screen is used to capture the details of Reimbursement bill.

- Change -This screen is used to change the details of existing Reimbursement bill.

Work Plan

- BOQ.-This screen is used to prepare work plan for BOQ Items

- DPR -This screen is used to prepare work plan for DPR Items

Reports Generation

Following reports are available in client billing module under the report menu.

- 01 Daily progress reports

- 02 Royalty reports - Royalty Details and Royalty Statements

- 03 RA Bill - RA Bill and Extract of RA Bill
- 04 Escalation Bill - Escalation Bill, Abstract of escalation bill and Computation sheet of escalation bill
- 05 BOQ list
- 06 Work location wise entry report
- 07 Deviation Statements

Costing

Earlier the company was following the nominal financial accounting system (FAS). The FAS was giving only the overview of the profits and was not capable of telling the different various activities and the costs generated by them individually. Hence, the company was not able to calculate the profit /loss from each of the activity and it was very difficult to calculate the difference between the client rate and the actual cost

that the company was incurring for the process. All these posed a deeper threat to the business of the company as even cost of the tenders set could not be calculated perfectly. Hence ,the company went for ORP and deciding to do the complete costing for each activity considering Product , Location and Activity therein.

LAJ has done activity based costing as cost of each of the activity is taken separately and then cumulated to total cost of the project. For a hydroelectric project, the costing constitutes of the following components: -

- Head works DAM
- Water Conductor System (the head race tunnel)
- Power House (where generation takes place)
- Infrastructure (includes roads, houses, hospitals, mess etc.etc.)

The company has divided the complete project and main heads (mentioned above) in to over 500 cost centre codes. The cost centers can be direct or indirect cost centres. Depending if the cost incurred has any hand in the production (direct cost centres) or the cost incurred is a support function to the production (indirect cost centres). The codes generated are 7 digit codes and are as following:
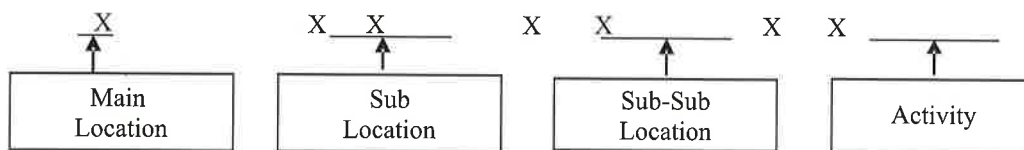
The diagram above shows the breakup of the coding done to define the cost centre codes. The first digit of the code is the main location. The various codes that can be for main location are as follows:-

Code 1 = Head works,   Code 2 = Head Race Tunnel

Code 3 = Power House   Code 6 = Infrastructure

The second and third digits of the code are for the sub locations i.e. if the main location is Power House then the sub locations can be :-

Code 11 = Transformer hall, Code 23 = Bus Duct

Code 45 = Machine Hall   Code 65 = Draft Tube etc.

The next two digits form the sub-sub location of the place where cost is being generated and finally the last two digits form the activity where the work is being done and money in any form is being used. The various activities included are: Excavation, Underground tunneling, Soil works, Concrete works, Steel reinforcements and Rock bolting. Etc. The costing module gets its information from various other modules of the software as following:
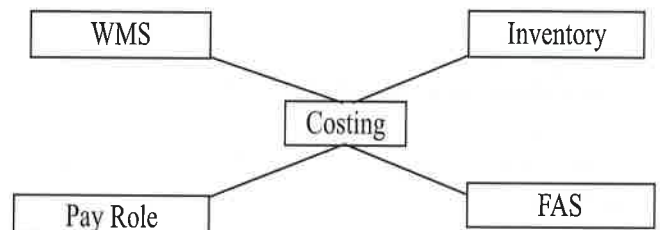
Figure VI : Cost Modules

The PAYROLL Dept. provides the information of the cost generated by the total employees and the INVENTORY department. tells the cost incurred in procurement of the materials. FAS (Financial Accounting System) provide other details of the costs generated and WMS (Workshop Management System) gives the information of the heavy machinery and its costs to the company. Hence all these other modules deliver the information of cost generated to the costing dept. and then the integrated cost is developed that tells the cost of the final project for a given time period.

Further on, Costing of the project is divided into two parts such as direct costs and indirect costs. The direct

Figure V : Break-Up of the Coding

costs covers:-

- **Power Cost**

The total power used in LAJ comprises of the power from the state electricity board (SEB) and the diesel generator Costs (DG SETS). The SEB cost is calculated on the basis of units consumed per month and the cost per unit is pre defined by the state govt. The DG sets cost varies with the variation in the rates of diesel and other equipments. The WMS (Workshop Management System) module helps the costing dept. to govern the per unit rate of the DG Sets and hence makes it easy to integrate the total cost spend on the power as well as electricity for all the direct and indirect cost center heads. Hence the power consumption all over the LAJ setup in hydroelectric project is feeded monthly and the total cost generated is known.

- **Equipment Cost**

The WMS module is very effective and provides the basic required information to the costing dept. The WMS covers all equipment, material, labour, diesel, deployment of heavy machinery and the cost incurred in these activities and forwards the information to the costing dept.

For example, A 'TRIP CARD' is given to each operator using heavy machinery like cranes, bull dozers, tippers etc. the card has a front side as well as a back side. The front side is used to capture the attendance of the operator and the back side has space which is filled up with information like where the equipment is deployed, who is operating it, what are the working hours, breakdown hours and idle hours of the machinery. This information helps in to calculate the per hour productivity of the machinery as well as the operator. Also it is easy to calculate the per hour rate of the equipment that is being used. This TRIP CARD is then send to the WMS dept. and when information is completed and fed into the system, further on forwarded to the costing dept.

- **Manpower Cost**

Two modules of the ORP i.e. HRM and PAYROLL provide detailed information to the costing department about the attendance of the employees. The information is based on the various cost centre codes and the employees working in these cost centres. Hence it becomes very easy to calculate the cost generated per cost centre of all the employees in that cost centre. Also various value works by the PRW (piece rate workers) is calculated by the billing department and then it is also supplied to the costing dept. The billing department has a separate PRW section which measures the output of the PRW and gives the monthly reports and payments information to the costing dept.

- **Material Cost**

The material costs are provided by the three different modules and they are as

Purchase, Receive and Inventory management

These modules of Maarsman1 provide the complete details of the costs incurred in the procurement of material and then finally can be accessed by the costing department. The Indirect Cost covers ,Production Cost, Service Cost and Overhead Cost

The Indirect costs are collected from the Financial Accounting System (FAS). In the project on an average the cost of any cost centre code is calculated on percentage basis such as Direct cost – nearly 70% - 80% of total cost.and Indirect cost – around 20% - 30% of total cost.

Where direct cost is incurred the indirect cost (total) is proportionally divided among various direct cost centre costs on basis of direct cost. The billing dept. takes the Direct Cost Centre Costs output per month e.g. how much concrete is used in 1 month is the output in DAM. This is given as the progress report to costing centre on basis of Direct Cost Centre Codes and then fed into the costing module.

Summary

LAJ being the first construction company in India, which has implemented the MIS. ORP has definitely gained a competitive advantage over its competitors. Even the distribution channel management has improved and resulted into quicker delivery times, problem free delivery, and preferential treatments. The investment in this technology, and the experience gained in learning how to use it, can be a role model in project construction industry. The company has obtained economies of scale in purchasing, and production; economies of scope in distribution; reduced overhead allocation per unit; and shorter break-even times. And finally over all Brand Equity of the company has also risen resulting into better profitability and more projects for LAJ in the later stages. 'LAJ' MIS implementation has produced major differences in the construction industry. They have installed the package for almost 90% of its project and in process of extend to full commercialization across its all project centres which would in turn help them to analyze the complete profitability of the company.

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