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Ann. 8.2 ERP Implementation Step by Step Process
801. Introduction

In the past, stand-alone IT systems have been set up by individual Repair Workshops, Locomotive sheds, Coaching and freight car depots and the Production Units to optimize their manufacturing and maintenance operations. Department centered systems like MMIS, PMIS, FMIS etc. were also developed concurrently, mimicking the departmental silo structure of Indian Railways. But these have limitations in bringing about overall efficiency and provide the management a common view of the organization at all levels.

802. Hence the need has arisen to evolve an integrated and self contained management system such as the ERP in each production unit, workshops and LCDs progressively, duly linking all departments within the unit. Every such ERP system shall however have a seamless interface not only with other Production Units, workshops and LCDs, but also already developed systems like FOIS, MMIS etc thus sharing freely all relevant and pre-determined information across departmental and other physical remote locations.

803. Enterprise Resource Planning (ERP)

Enterprise Resource Planning (ERP) is an information system designed to coordinate all the activities, resources and information needed to complete business processes such as Design, Production Control, Quality Management, Asset Maintenance, Inventory and Warehouse Management, Project management, Customer Management, Purchases, Costing, Accounts and HR functions. ERP systems are centralized and have the capability of integrating with other existing systems in order to achieve the best optimization. These systems also bring best practices from industry that need to be adopted with suitable change management to modernize work practices. Therefore suitable efficient workarounds may be adopted with adequate consideration to the impacts of changes.

ERP systems should be founded on a common database and a modular software design and should allow every department of IR to store and retrieve information in real-time. The information is reliable, accessible, and easily shared. The modular software design allows the user to select the modules he needs, mix and match modules from different vendors, and add his own new modules to improve his organizational performance.

804. ERP systems originated in manufacturing industry and hence, “Production Planning and Manufacturing” forms still the core of these systems. Production Units and Workshops on Indian Railways are thus ideally poised to adopt this new technology. Industry specific versions of the modern ERP systems cover a wide range of functions such as Human Resources, Supply Chain Management, Customer Relation Management, Financials, Manufacturing and Warehouse Management, integrating them into a single unified application.

805. ERP Infrastructure:

In the fast changing world of IT, it is inappropriate for the code to rigidly define in detail, the infrastructure requirements; and hence an outline is spelt out below:

[Type text]
a. Centralized system with no EDP centre at the train care centers.
b. Integration between divisions, zonal headquarters, Railway Board. RDSO and between sister applications- wise-II, LMS, FMM, PU-ERPs and CMMS
c. Country –wide network connectivity
d. Ease of data entry and automation: kiosks, touch screens, RF-ID card for man & material, hand-helds for yard work, PDAs, e-pens etc.
e. Web based system which can be accessed from anywhere.
f. Single point access to all managers through a common web portal: ROAMS-Rolling Asset Management System.
g. IP based local area network built to latest industry standards. Back-bone of such a network should be rest on optic fiber cabling, with at least two parallel paths to each shop providing adequate redundancy to cover damages or outages.
h. LAN for PUs and Train Care Centers treated as a part of basic M&P infrastructure and kept in view while planning.
i. Connect to outside world with adequate security measures to avoid any malicious attack at the ERP installation.
j. Internet access should be provided in workshop LAN through a secure source with appropriate network security infrastructure.
k. Wherever a network is planned for computer aided manufacturing or FMS, it should be secured from the IP based network installed for the ERP application.
l. All CNC M&Ps including testing and measuring equipment as far as possible should be procured with facility for data exchange with ERP system and capability to integrate with the IP network for on-line access of manufacturing data from ERP.
m. There should be a CORE team for implementation, change management and user support in the PU/Workshop with a full time set of officers to look after the Enterprise Application and Industrial Automation (EA&IA) functions in the workshops and PUs.
The EA&IA wing in any Production Unit or Train Care Center shall be responsible for maintaining the local area network through specialized agency to ensure required uptime to support the applications. This organization shall be responsible for continued growth and development of the application, organizing user training, refreshers, change management trainings and maintain liaison with application hosting agency and the industry.

806. System Security:

The system should provide for adequate security such as user Identification Numbers (User-ID), passwords, biometric identification protocols, codified smart cards, provisions for using digital signatures to ensure that only the authorized personnel can have access to data, stored in the system. Where a person is authorized only to access data without modification rights, his/her access rights should be correspondingly restricted. Where a person is to be authorized to enter fresh data, access stored data and modify the same including deletion of the data, provision should be available to give the person all rights in regard to the data. Only the system
administrator and his/her assistants required to access the data bases and programs should be given corresponding access rights. The system should provide for recording the identification detail of the person who accessed the system to view data, enter, modify or deleted a data for investigation purposes if required. The system should also have a built in login register in the form of computer files to have a record of the log-in and log-off time of all the persons who have been given the access rights of various levels, for investigation purposes where required. The computer files containing the log-in and log-off details should be preserved for as many years as applicable to any other vital office records. The system also needs to cater to exigencies of data breach, denial of service, protocols to address security breaches and mechanisms / procedures that may be initiated in case of such breach of the system.

807. Training:

Training and continued retraining are essential to develop IT temper amongst workshop personnel. Compulsory courses should be introduced for freshly inducted personnel of Group-C and D for all categories. Workshop training centre should be developed to undertake such trainings. Standard course modules should be developed in consultation with ERP experts. There should be a provision of refresher courses after every two years. In addition, the EA&IA team should be trained in appropriate IT technologies for both network and application related areas through OEMs and certified training agencies on need basis. There should be an annual “Enterprise Group Conference” (EGC) for interaction and exchange of IT development issues at all India Railway level in the same lines as done in the Maintenance group meetings (WMG, DMG etc.). In order to ensure continued development and IT enablement of workshops and production infrastructure, EGC meetings should be conducted under guidance of the Railway Board. And as part of standing EGC agenda, periodicity and course content of the training courses should be reviewed.

808. E-Library

Production units and train Care centers shall develop an E-Library of their own, which should, inter alia, ready access to documents and drawings as relevant to all the users in the unit, subject to copyright/patent right / intellectual property/pricing restrictions.

809. Implementation of ERP in IR

An integrated and self contained management system (such as the ERP) has to be evolved in each Production unit and workshops and open line sheds and depots train care center, duly linking all departments within the unit.

Once the implementation is done, the EA&IA group, should ensure an in-house support system by way of trained employees and tie-up with external software and hardware support vendors are put in place at all times to ensure continuity in the usage and further improvement with the change in technology. The post implementation Organisational structure in PU/Workshops will need a different set of [Type text]
roles and skills than those dealing with less integrated kind of systems, which shall be defined at the level of Board.

810. **Areas to be covered under Workshop ERP application:**

The following modules can be available in a ERP based workshop management system:

a. Production planning and control  
b. Workshop Inventory management  
c. Work in progress management  
d. Machinery and plant maintenance management  
e. Inprocess Inspection and quality control  
f. Supply and Vendor management (Integration with MMIS and e procurement)  
g. Monitoring and progress  
h. Business intelligence for Reports and analysis  
i. Document handling and E-library system  
j. Workshop General management  
k. Attendance management system  
l. Need based Integration with legacy applications including purchase, personnel and accounts applications  
m. Need based integration with production infrastructure.  
n. Use of automation devices at user interface to minimize use key board at shop floor

The above list is illustrative and not exhaustive

**ERP Sub-systems:**

811. **Work Order Computerization**

Work order is the first stage and also the basic unit of activity in a production shop. This comprises of product identification, batch size, work process, bill of materials-manufactured items, bill of materials- bought outs, job cards containing allowed time etc. Every step has to be part of one integrated sequential action / process. Data entry should only be through swipe cards / work station key board. There should be no provision for data alteration without digital authorization. Work order closure will occur on elapse of allowed time or by foreclosure. Short produced quantities have to be entered into the data base to work out revised allowed time and material issued left out. Surplus material drawn will require suitable entries to be made and acknowledgement from the Store keeper to be recorded in the data base. Provision should exist to cross verify the workers job execution with gate attendance – by data base integration and connectivity.

812. **Gate Attendance:**

Gate attendance will be through a smart card based on bio-metric identification. The attendance card has to be used as authentication for making any data entry in connection with work order or job cards; this will ensure that the nominated worker only executes the job, and entries are made by him. Reconciliation
of gate attendance hours and hours logged on job will be automatic. Accountal of overtime/saved time becomes error free.

813. **Incentives:**

As discussed in Chapter 5, IT based systems help in establishing linkages between attendance and related accounting/managerial reports:

By this, linkage of incentive payment with shop out turn as well as group performance becomes automatic. Excess material drawn gets listed out automatically.

814. **Supply Management and Stores Accountal:**

This subject is covered in the Stores Code and the MMIS which drives Material management functions in the Railways.

The IT system can be modeled on same platform as proposed ERP based integrated MMIS. All data entry and retrieval will be from the same data base which will be managed by a data base management system which in turn will be part of the ERP system.

815. **Quality Management:**

Data entry should be mandatory for every rejection against a work order, to facilitate accountal of actual hours as well as materials used or wasted. This data will incorporate job card number, worker ticket number, Supervisor particulars and Inspector’s name.

816. **Post out turn rejection**

Zonal Railways may encounter problems on new stock as well as stock turned out after maintenance. Basic record of new stock has to be in one data base, into which all subsequent repairs, IOHs, POHs etc have to be entered. Data relating to all failures also will be entered here – directly by the Railway- where failure occurred. These will be thrown up as exception reports at the workshops where manufacture / repairs were done.

817. **ERP systems for open line depots and sheds.**

All open line sheds and depots shall have HR modules. In addition to this, open line units shall digitize the functions as relevant to the type of rolling stock dealt therein like integration with Operating Information Systems pertaining to maintenance of rolling stock, performance parameters for maintenance, budget/expenditure management etc.

818. **Conclusion**

Suitable productivity tests must be done in order to assess the impact of implementation of ERP systems. Generally, answers in the affirmative to the following [Type text]
questions will determine the effectiveness of ERP systems and whether real benefits are being derived from it:

a. Has cost accountal and analysis become dependable?
b. Are verifications and actions shifting to the system from manual dependence?
c. Wherever manual dependence is unavoidable does the system act as a deterrent and provide alerts or exception reports to the top management?
d. Are the managers getting expenditure statements in real time?
e. Does the system ensure that no failures and detachments go unreported and
f. Trace the defect to the shop or shed where it originated from and to get in real time the cause-wise failures in the descending order

g. Does the system generate data to support procurement decisions on “life cycle costs”, at least for A category items
h. Total expenditure on maintenance annually for each type of rolling stock
i. Cost of POH, cost of maintenance for each type of rolling stock and each painted number as juxtaposed to the utilization
j. Ensure a much higher compliance ratio with lower inventories
k. Is the higher management able to compare at a glance on a daily basis,
   i. best practices between shops and sheds and adopt them
   ii. Able to weed out money guzzling rolling stock
   iii. Cost of manufacture between PUs and regulate ordering
   iv. Cost of POH between workshops
   v. Timings for various activities between shops and adopt the best practices
Annexure 8.1

ERP Implementation Step by Step Process

1. **What is the ERP life cycle?**

   ERP lifecycle is one which highlights the different stages in implementation of an ERP. There are different stages of the ERP implementation as given below:

   - Pre evaluation Screening
   - Evaluation Package
   - Project Planning
   - GAP analysis
   - Reengineering
   - Team training
   - Testing
   - Post implementation

2. **Pre evaluation Screening**

   Once the organization has decided to go for the ERP system, the search for the package must start, as there are hundreds of packages it is always better to do a thorough and detailed evaluation of a smaller number of packages, then doing analysis of dozens of packages. This stage will be useful in eliminating those packages that are not suitable for the business process.

3. **Evaluation Package**

   This stage is considered an important phase of the ERP implementation, as the package that one selects will decide the success or failure of the project. Implementation of an ERP involves huge investments and it is not easy to switch between different packages, so the right thing is ‘do it right the first time’. Once the packages to be evaluated are identified, the next stage is to develop selection criteria that permit the evaluation of all the available packages on the same scale.

4. **Project Planning**

   This is the phase that designs the implementation process. It is in this phase that the details of how to go about the implementation are decided. Time schedules, deadlines, etc for the project are arrived at. The plan is developed, roles are identified and responsibilities are assigned. It will also decide when to begin the project, how to do it and its completion. A committee comprising team leaders of each implementation group usually does such a planning.

5. **GAP analysis**

   This is considered the most crucial phase for the success of ERP implementation. This is the process through which the organizations create a complete
model of where they are now, and in which direction will they opt in the future. It has been estimated that even the best packages will only meet 50% of the organization’s requirements. The remaining 20% presents problematic issues for reengineering.

6. **Reengineering**

   It is the phase that human factors are taken into consideration. While every implementation is going to involve a significant change in number of employees and their job responsibilities, as the process becomes more automated and efficient, it is best to treat ERP as an investment as well as a cost cutting measure.

7. **Team training**

   Training is also an important phase in implementation, which takes place along with the process of implementation. This is the phase where the organization trains its employees to implement and later, run the system. Thus, it is vital for the organization to choose the right employee who has the right attitude- people who are willing to change, learn new things and are not afraid of technology and have a good functional knowledge.

8. **Testing**

   This is the phase where one tries to break the system. One has reached a point where the organization is testing the real case scenarios. The system is configured and now you must come up with extreme cases like system overloads, multiple users logging on at the same time, users entering invalid data, hackers trying to access restricted areas and so on. This phase is performed to find the weak links so that it can be rectified before its implementation.

9. **Post implementation**

   Once the implementation is over, the vendor and the hired consultants will go. To reap the fruits of the implementation, it is very important that the system has wide acceptance. There should be enough employees who are trained to handle problems that crop up time to time. The system must be updated with the change in technology. The post implementation will need a different set of roles and skills than those with less integrated kind of systems.

   However, maximum value of these inputs can be realized if the system is successfully adopted and effectively used.