

ERP Implementation in Oil Refineries

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Over recent years the acquisition, implementation and use of Enterprise Resource Planning (ERP) Systems have become a standard feature of most national and multinational companies in Pakistan. To date most of the literature on ERP implementation has focused on the standard methodologies of ERP implementations.

This article focuses on ERP implementation specifically in refining industry and highlights the issues faced by implementers in this industry.

Axline Markus defines ERP systems as "commercial software packages that enable the integration of transaction-oriented data and business processes throughout an organisation".

ERP systems provide cross-organization integration through embedded business processes and are generally composed of several modules, including human resources, sales, assets management, procurement, project management etc. World's leading ERPs include SAP, Oracle, Peoples Soft and JD Edwards.

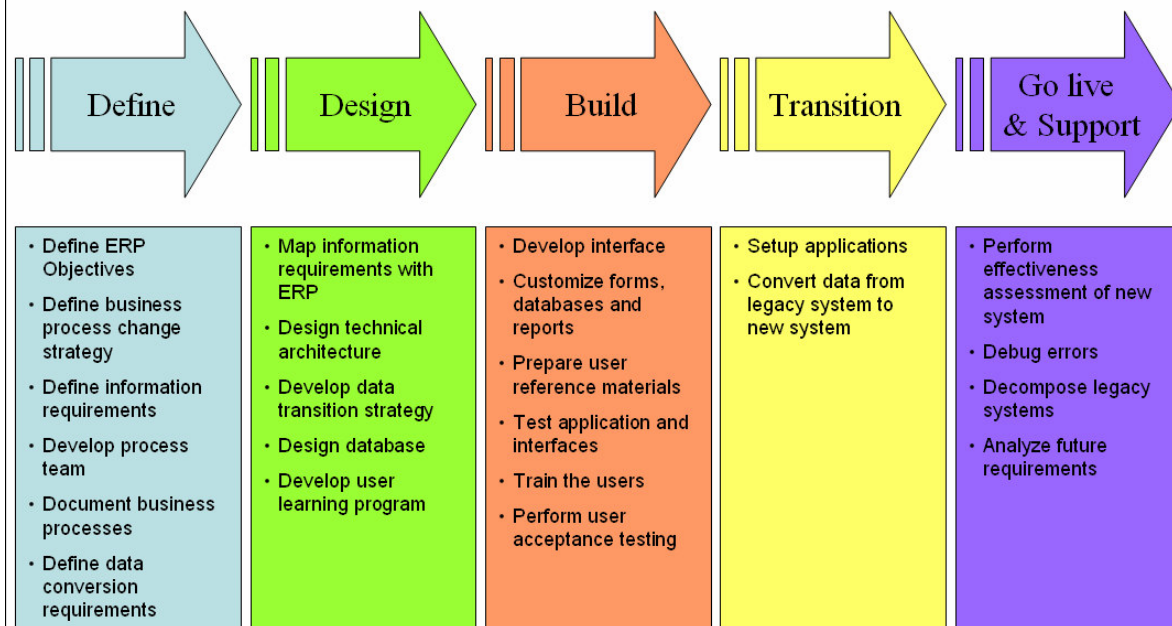
During the 1990s ERP systems were the de-facto standard for replacement of legacy (old) systems in large companies around the globe. In Pakistan, a large number of national and multinational companies, including Sui Southern Gas Corporation, Pak Arab Refinery Limited (Parco), Pakistan Tobacco Company, ICI Pakistan Limited, Pakistan State Oil, Shell Pakistan Limited, Unilever Pakistan Limited etc, have implemented or going to implement ERPs system.

The impact of ERP systems is so broad, touching many internal and external aspects of an organisation's operations, that the successful implementation and use of these systems are critical to organisational performance and survival.

Various oil refineries in Pakistan e.g. National Refinery (NRL), Pakistan Refinery (PRL) and Parco have recently implemented SAP and Oracle Financials applications to streamline their business processes. Major business processes of an oil refinery include procurement of crude oil and other feed stock, inventory management for hydrocarbons and stores and spares, product sales, production planning and scheduling, assets management, financial and operational budgeting and financial and managerial reporting.

Following a tested implementation methodology is a prerequisite for successful ERP implementation. All implementation methodologies e.g. Oracle Application Implementation Methodology (AIM), Accelerated SAP (ASAP) etc suggest at least five phases of ERP implementation: Define; Design; Build; Transition; and Go Live & Support.

Fig I: Phases of ERP Implementation



Some methodologies split a phase into two and someones merge two phases into one. These phases have been depicted.

During "Define" phase, the company implementing the ERP should clearly determine the objectives of ERP implementation, business process change strategy and its specific information requirements (e.g. production quantities at various temperature and pressure levels in an oil refinery).

Current (as-is) and future (to-be) business processes should be documented. A dedicated project team should be developed and trained for ERP implementation. Various ERP systems should be evaluated on the basis of information requirements of the company.

A gap analysis should be performed between specific requirements of the refining industry and features available in the ERP products and the best-fit product should be selected. Data conversion requirements should be analysed. Readiness plan for senior and middle management should be developed.

In "Design" phase, information requirements should be mapped with the features of selected ERP. Technical architecture and interfaces of various applications with ERP should be designed, data transition strategy should be developed, functional and technical design of databases and applications should be finalised, and user learning plan should be developed.

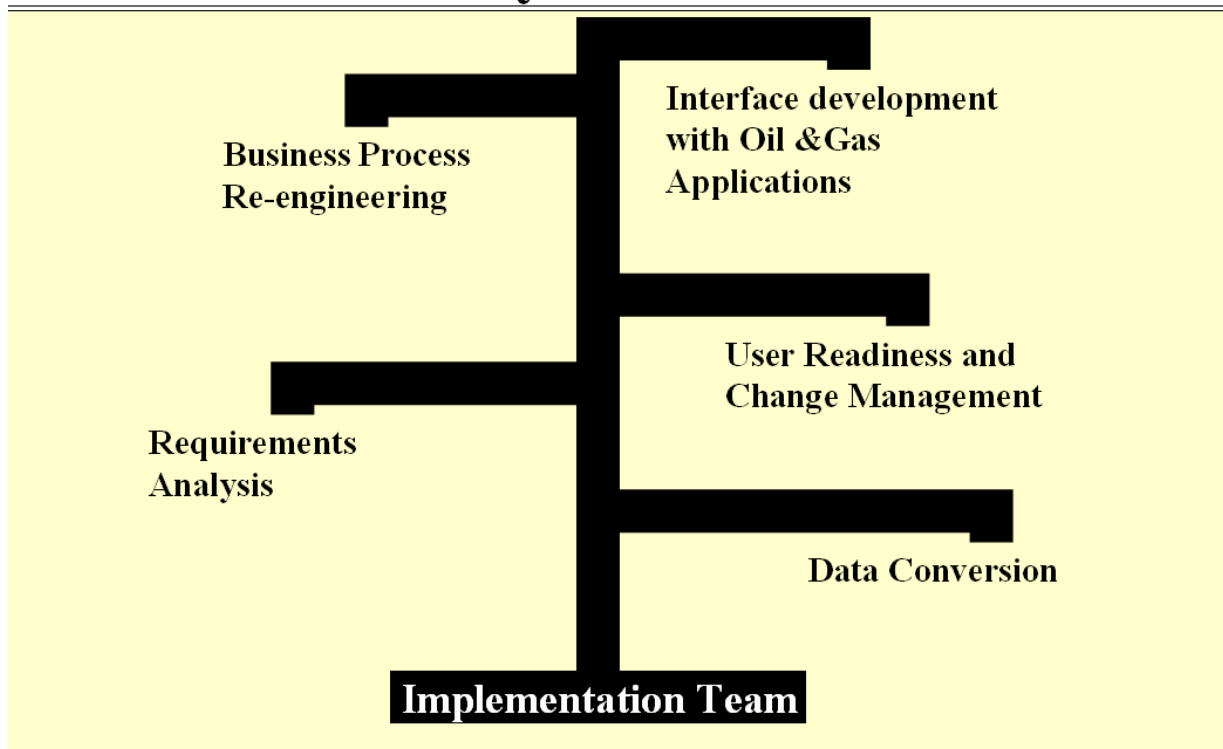
During "Build" phase, interfaces between various applications should be developed, application forms & reports should be customised if required, data conversion programs should be developed, user guides and necessary reference material should be prepared, and applications and interfaces should be tested for all business scenarios in an integrated environment.

In this phase, all users of the applications should be provided with adequate training. User acceptance testing must also be performed in this phase. "Transition" phase involves applications setup and conversion of legacy systems data into the new system.

"Go Live & Support" phase is the final phase in ERP Implementation. In this phase, ERP should be assessed for its effectiveness, all errors appeared in live environment should be removed, legacy systems should be decommissioned, and future information requirements should be analysed.

During implementation of ERPs at oil refineries, few tasks are critical for making the project successful. These tasks, as depicted in Figure 2, include business requirements analysis, mapping business solution with company's requirements, business process re-engineering, development of interfaces with other applications, data conversion from legacy to new system, and user readiness.

Fig II: Issues of ERP Implementation in an Oil Refinery



The reason of major ERP failures at oil refineries is that these steps are not adequately handled during the implementation.

Oil refineries usually require unique sets of information for their operations. For example volumes of hydrocarbons change with a change in temperature or pressure. An Oil & Gas Accounting system should be capable to convert the volumes of hydrocarbons at natural temperature & pressure to those at specific temperatures (e.g. 85 F).

Similarly, an Oil & Gas Accounting System should maintain calibration charts and records of dips to determine the product quantities. A refinery consists of a chain of process units (e.g. crude distillation unit, hydro-treating unit, catalytic cracking unit etc) Output of one unit may be input for other unit(s). Production Scheduling Software for the refinery must have capability to record the flow of raw materials and semi-finished goods from one unit to the other.

Most of the ERPs do not provide the features to capture refinery specific information. Oil refining companies usually develop their in-house systems for oil & gas accounting, refinery management and production scheduling.

During ERP implementations, if refinery-specific information requirements are not correctly captured during "Requirements Analysis Task", it results in ERP failure because the new ERP is not in a position to satisfy the information requirements of top and middle management.

Similarly incorrect mapping of business processes with application features may result in complete ERP failure because the system will not be able to capture all business processes according to company requirements.

If a refining company decides to develop its in-house application to meet its specific information requirements, it takes a long time to develop and implement the application. Debugging of a new application takes a long time, which results in overall delay in the project.

Development of interfaces and their testing requires more resources, effort and time. Problems in poorly-designed interfaces result in failure of entire project.

Legacy systems of oil refinery usually do not work in an integrated environment. They do not have enough capabilities to record the information as compared to new ERP systems. During implementation, it becomes difficult to fill all the required fields of new systems due to which data conversion exercise faces a lot of problems.

Mapping of fields in new and old system also becomes a major issue because the users are familiar to old conventions and it is very difficult for them to recognise the new chart of account, new supplier and customer codes etc.

Lack of change-management skills in project team also results in project failure. As Peter Drucker points out, "Experience has shown that grafting innovation on to a traditional enterprise does not work. The enterprise has to become a change agent... Instead of seeing change as a threat, its people will come to see it as an opportunity."

In my opinion, the biggest problem in ERP implementation in oil refineries is inadequate user readiness. Most refineries at Pakistan are owned by the public sector. A significant number of employees in these refineries are not properly trained to use an ERP.

It is a recognised fact today that if a technical solution such as an ERP does not induce necessarily the expected changes, it is not because of the technology, it is due to lack of adequate social changes required for the success of an ERP system.

Technology itself does not induce the social game, the collective process. Only people together are able to make a success, or a failure, or neutralise technical systems, especially complex ones such as ERPs. In the words of Ann Miller points out "People are always key to any process improvement, so methods to help staff ramp up on the learning curve of a technology or process are extremely important."

ERP implementers should keep in mind a few realities while planning for change management. Firstly, facing change, one should remain modest because the collective game builds itself without obeying to any single will or to any predefined planning.

Actors have to build the story together. Secondly, one should not start from the ERP technical solutions, but from problems to solve, that is to identify actual needs before making an adapted and robust technical offer.

Thirdly, in order to be able to analyse problems and evaluate needs, one should remain attentive to people and social behaviour so that help in educating people can be provided: both individual education (learning what the ERP modules are doing and how to use them) and collective education (learning how to integrate the ERP in each department or service operational practices).

For example, mastering all the new accounting capabilities of the ERP Finance module requires building a new knowledge base among all the individuals first, then in the Accounting Department(s) as a whole. Actually, any success will depend on the collective evolution of the organisation.

As far as resistance to change is concerned, the most problematic issue is that there is no resistance to change per se, neither because of habits gained, nor because of any "social inertia".

However, resistance to change does occur and has got a twofold origin: technology resists and social organisations too. Technology resists because it has got its own principle of reality: for example an ERP by itself will never be able to deliver manufactured goods, only a co-ordinated organisation can. Social organisations themselves have their own principle of reality.

They do not resist just for the sake of resisting, but build their needs depending on their goals and evolution of beliefs.

When technology meets a market ready to pay for it, there is no resistance. Just to make sure, see the speed with which such technologies as fax machines or mobile phones have spread.

Resistance to IT was caused by being tired of forced computerisation failures and tired of forced obsolescence of hardware, software and IT concepts. Operational users are fed up with this ongoing race to innovation, since the situation they are living in is not yet stabilised.

The discourse about the "technological plus" has come to some discredit among users who do not hesitate any more to express their concern. Technology evolves at such a pace that it generates what is called "techno-stress" among staff at all levels of an organisation.

In fact, workers say they are "techno-stressed" because they have to learn, know and use technologies that are constantly evolving. Moreover, they consider they have little control over the choice of technologies to use and they lack training on them.

Five major factors have been identified as generating "techno-stress": System problems; computing errors; Learning time for getting used to new technologies due to the fact that technologies said to be "time-saving", increase tasks more than they alleviate them; and also the difficulty of following the fast evolving technologies.

To this, one can add the "technology-aided employee scrutiny" which results in job loss of those employees who are not capable enough to update themselves with the fast-moving technology.

According to various surveys, it seems that "techno-stress" is more and more affecting executives and managers. They fear IT generates a loss of privacy, an information overload, a lack of personal contacts, a need for a continuous learning of new skills and the missing of promotion due to lack of IT knowledge. Managers who frequently avoid technologies and suffer from a lack of technical knowledge, have nevertheless to make decisions about buying expensive IT equipment and have to manage investment, education and support budgets.

Moreover, it seems that managers who are familiar with technologies also suffer some "techno-stress" because of the fast changing pace of IT in short, the preceding human factors are paramount when it comes to ERP implementation and may explain to some extent why an ERP needs a lot of care and support when deployed in an organisation both by internal management and external consultants.

Although these issues can be faced by any organisation but due to lack of skilled and motivated staff, refineries in public sector usually face these problems around the globe. We expect that in near future, if properly implemented with all issues addressed properly, ERP systems will become an integral part of oil refineries information systems.

The author is a risk management professional currently working with Moore Stephens International. He has worked with various multinational and national organizations in the discipline of risk management including Ernst & Young, Unilever and Pak Arab Refinery Company. He has over 10 years of experience in this field.

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