Enterprise resource planning: business needs and technologies

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Introduction
The difference between a successful and profitable organization and an average one is the quality of service. The quality comes when companies undergo a “metabolic change” in the way they manage customers and potential prospects. The smart organizations today could anticipate and exceed customer expectations that are evaluated on the basis of quality, time, service, availability and efficiency. The one tool that innovative and progressive organizations have come to increasingly depend on in this endeavor is enterprise resource planning (ERP) solutions. ERP has been a software solution integrating the various functional spheres in an organization—a link through the entire supply chain, aimed at adapting best industry and management practices for providing the right product at the right place at the right time at least cost. Over the last decade, there has been a significant shift in business models from hierarchical line-of-business-oriented activities to more process-driven activities that is motivating a re-examination of enterprise applications software. The challenge for ERP systems is to set up and integrate information resources across geographically spread business units to enable optimization across the organization.

The objectives of ERP systems include:
1. provide support for all variations of best business practices;
2. enable implementation of these practices with a view towards enhancing productivity; and
3. empower the customer to modify the implemented business processes to suit their needs.

Building a customer process through ERP
To understand how an ERP could help build world-class customer process, it is essential to examine the following:
1. The benefits that accrue from a customer-centric system include:
   - Loyal customers cost less and buy more year after year. The time lost in recouping the cost of acquiring a new customer is saved.
   - Referral revenue—which occurs when the satisfied customer refers his associates to the firm, is increased and subsequently, the longer the relationship with a customer, the more new customers are referred to the firm.
   - The premiums by way of loyal customers who would pay more for the products because of satisfaction with the quality delivered and do not want to risk trying another product. Loyal customers will not be tempted to defect by the competitor’s discounts and they would not require discounts to stay with the firm.
   - The loyal customer also grows into an experienced customer who has learned the product line and processes thereby supporting self in a number of transactions when the firm work together that further brings down costs. Organizations can also increase customer inventory by taking the customer reuse in the form of referrals, thereby almost doubling the customers in half the time.

2. What tools, techniques and analyses that an ERP would incorporate, in order to make it customer-centric:
   - Data needed to improve customer profitability.
   - How do the firm provide the data needed to improve customer profitability?
On an average, firms lose 50 per cent of their customers in five years. How many leads do the firms pursue to get an order from a new customer? In some industries, recouping the cost of acquiring a new customer takes years. It is no surprise that firms that keep valuable customers are more profitable than those with little repeat business.

Customer valuation models to quantify revenue potential – on account of referral value, premiums, lower support and relationship costs, and therefore, identify least and most profitable customers – a shift from mere order based profitability analysis.

New methods of measuring customer revenue and costs would necessitate a shift from the traditional method of accounting that hides the benefits of loyalty. Activity-based costing could go some way in meeting these requirements. Statistical analysis in terms of quartile rankings of a customer by profitability would supplement total analysis in evaluation of the customer.

Increase in profits on account of retention of customers. While it is well recognized that retention of customers adds to profits, ERP solutions quantify the increase in profits which may vary by industries.

Customers need to be classified and analyzed as individuals, not just merely as a member of any class such has high-income groups, urban teens, etc.

In case of defections of customers, the reasons would have to be analyzed. These could be quantitative (pack size or price), or qualitative (brand positioning, packaging, campaigning).

Loyalty triggers – what the customer values in the firm and the product.

All the above means the ERP products and suppliers have to be more alert in today’s changing scenario to don the mantle of the ERP user and visualize the objectives of ERP from the customer viewpoint.

**ERP technologies**

Information systems technologies evolved from mainframe-based computing through the client server era to the Internet era. These distinct phases are marked by parallel development in hardware technologies. The client server era began when computing power delivered at desktop machines increased manifold and matched mainframe computing power. These technologies limited the availability of information services to users within an organization. The Internet era has brought in the ability to deliver information around the globe. This is made possible with advancements in communication infrastructure.

With the arrival of the Internet, the biggest challenge facing ERP suppliers is to address the global access issues and deployment of information systems that would cater to intra-organization and extra-organization needs effectively. Over and above these challenges, ERP systems need to leverage these technologies to deliver complete (best business practices), usable (high productivity) and adaptable (easy installation and post-implementation maintenance) business systems.

**Existing ERP systems**

ERP systems that are currently available belong to the client server era. These systems are built with a clear separation of functional components. The user interface implemented using graphical user interface (GUI) techniques is deployed on client machines. Powerful server machines host the databases and business logic written as server procedures. The databases are built using relational database technology. Business logic is split, depending on the product architecture to be executed on the client, server or both.

With suitable communication infrastructure, these systems could be deployed in a distributed process which may span across multiple geographical locations. As an example, a purchase request could be raised at a plant location to be processed by a purchase department located miles away from the plant.

The technologies deployed have allowed the ERP suppliers to meet the requisite objectives. Relational database systems have enabled the vendors to put in the necessary flexibility in terms of business logic and data structures to support parallel business practice implementations. GUIs support the usability aspect of business systems by providing intuitive and consistent user interface. Object-oriented development practice employed in building GUIs has enabled the suppliers to provide for easy customization and extension of interface components to accommodate additional data entry. These technologies in general have allowed the users to architect the system in such a way that installation, customization and extensions are possible in shorter timeframes.
The technology areas that apply to ERP systems are:
1. database systems;
2. communication protocols; and
3. user interface framework.

**Database systems**
The current database systems are based on relational database management systems (RDBMS) technology. These database systems support querying using standard query language known as structured query language (SQL). Business logic which specify the set of actions that need to be performed (such as check stock situation and update inventory) is written using SQL and is invoked when the user performs an action. These database systems support access of multiple distributed data sources and allow synchronizing of data manipulation across these sources.

ERP systems built on this technology would support organizations with the need to set up distributed systems with less dependence on a central information resource location. Use of standard query language would enable organizations to perform post-implementation maintenance with confidence since the systems in place are not tied to proprietary languages. The skill needed to do this activity would not be at a premium in the marketplace. Scalability issues are addressed, since sizing of hardware may be done to cater to the business process activities performed at a specific location. Addition of new location(s) would not lead to disruption at other locations.

**Communication protocols**
The clients and servers in an ERP are connected on a communication backbone. The protocols employed standardize the way data exchange takes place across the network. Database systems employed at servers and the processes on the client use this protocol to send and receive data over the network. Database protocols are specific to the database management systems employed. Since, database systems employ common relation technology, the data exchange is based on a common open data base connectivity standards. Most of the ERP systems use this to integrate client software with the business logic procedures present on the server. Since communication protocols are standardized, organizations could leverage advances in communication infrastructure without worrying about the information systems that are supported.

**User interface framework**
User interface component of an ERP generally follows GUI approach. Use of GUI-based user interface enhances the usability of ERP systems. GUI standards are derived to provide the best application ergonomics with proper design. Interface elements applied in a consistent manner greatly improves usability and helps in user training.

The operating systems environment at the client (such as Windows NT and Windows 98) provides the graphical user environment. User interface for ERP products conforms to the standards recommended by the operating system vendors. This ensures minimum discomfort for users when they move from a standard desktop application (such as MS Word and MS Excel) to the business system application.

**Organizational preparedness for embarking on ERP**

1. **Infrastructure resources planning**: the objective is to ensure that adequate infrastructure is planned for in a way that it becomes reliably available well in time (both for the pre-implementation and the post-implementation stages). Hardware and networking infrastructure is something quite basic and required even for non-ERP applications. Moreover, network standards are generic, common for all ERPs and therefore could be planned and put in place in advance. As far as ERP is concerned, a reliable LAN, with adequate bandwidth, must be in place well in time because ERP implementation is tough and it should not have to contend with the teething problems of networking.

2. **Local area network**: the network trend today is for a centralized server location even on a wide spread campus. Category 5 UTP structured cabling with fibre optic for the campus and switched Ethernet or fast Ethernet would be adequate for any ERP and would also support other applications.

3. **Servers**: these would depend on the ERP selected and could be ordered only after the ERP has been selected. However, it is better to plan for a lower end server that would be available for training and modeling. This could be made available from the time the decision for the ERP is made, because most organizations take a long time in deciding about which ERP package to deploy, but from then onwards, the number of days taken get counted. Adequate server/network, even during
the training/modeling phase, must be available.

4 PCs: if the PCs that were bought were the latest configuration, they would be quite adequate for most ERPs.

5 Training facilities: adequate training center must be planned for. Temporary centers with makeshift facilities could be counter productive.

6 Human resources planning: what makes ERP difficult to implement is that it could succeed only through teamwork and the team size spans across the entire organization.

7 Education about ERP: if people have to have the right attitude, they must understand what ERP is and also what it is not. Across the organization, ERP education should be carried out. This could be about ERP principles in generic items and case studies to point out what attitudes and principles have succeeded at other places and what have been the stumbling blocks.

8 Commitment to release the right people: if ERP is recognized as a difficult but necessary project, then the best people must be released for it on a full-time basis. Those who could not be spared are the ones who would be required on the ERP team. Adequate advance planning is often necessary to be able to release the best people. There must be commitment for this at all levels.

9 Top management’s commitment: making ERP as one of the top projects for the company for that year and to link assessment of the company head and other people with the progress of ERP implementation. The top management must also have the willingness to allow for a mindset change by accepting that a lot of learning has to be done at all levels, including themselves. This attitude would open up forums, like the exchange of ideas with people who have already done it and videos of successful implementation.

10 Commitment to implement “Vanilla version”: 80 per cent of the benefits come out of integration, geographical transparency of the data, actionable information to people who are front-ending the customers, etc., but only 10-20 per cent of the customization needs come from these areas. A total of 80 per cent come from areas that are handling statutory requirements. There should be a clear policy to implement the ERP in the “vanilla” form (without customization) and only six months after the implementation to review. This way, 80 per cent of the benefits would be achieved that much faster. Overall company morale also would be high if the implementation is completed at quick speed, even if it is not necessarily the optimal implementation. Making everybody understand this is a very crucial preparatory job.

11 Ability and willingness to consider an ongoing site as a Greenfield site: implementing an ERP on a Greenfield site is always much easier than an existing site, because at an existing site, unlearning and retraining are major steps. Also, migration of past into the new system is not required. Coupled with this is the fact that it is not easy to spare people from their current jobs to take on the new task. However, if a company is willing to consider an ongoing site, almost as a Greenfield site, and focus on learning and implementing only the new procedures, the implementation could be speeded up considerably. In the interest of speed, even migration of old data can be kept to the minimum to begin with.

12 Reasonably well working manual systems: similar to the manual systems followed for materials management like stores procedures, discipline of doing work through documentation is also a necessary prerequisite. An audit should be carried out to find the current status and correction action, and training carried out to make the current systems give an acceptable correspondence between the physical stock and book stock.

13 Strategic decision on centralized vs. decentralized implementation: most organizations have more than one manufacturing location and all organizations have branch offices. The broad decision one needs to make is whether each location would have servers or would they be only centrally located. It would be worthwhile to go for centralization of IT resources.

14 Major reasons for centralization: the overall centralized costs are found to be two to three times lower compared to the decentralized ones. Cost of consolidating is dramatically reduced. Larger the server platforms, lower the costs per user. The operating system and RDBMS are much lower (only add-on client software is required at remote sites). Costs of providing for redundancy and fault tolerance are considerably reduced. The manageability and IT expertise required are reduced many fold. The availability of data at one place results in a more complete empowerment of people through
a complete view of all information, absolutely online. Premises rent for server rooms are reduced/eliminated, more significant in major cities. Power conditioning needs and the need for standby power are considerably reduced. The implementation of software is far easier. Introduction of total standardization is easily possible. The need for consolidation and reconciliation is totally eliminated.

**Evaluating investment on ERP**

Recent trends in the business are forcing manufacturing enterprises to face the new phenomenon in the business environment with the help of IT. Manufacturing enterprises are contemplating to go in for an ERP package. Most of the manufacturing enterprises, irrespective of their size, are in a fix, in the selection of an ERP package.

Any ERP package whether it is developed by a system department in an organization or bought as a ready-made package from the market needs a substantial capital investment. There are four options available for acquiring or developing any ERP solutions, viz.: developing an own ERP package; enhancing the capabilities in the existing application software; buying a ready-made ERP package from the market; and engaging the services of a software company to develop a software package.

1. **Developing an own ERP package:** Only possible where the organization has qualified software professionals with practical experience. Generally, software professionals are not familiar with the business functions and business practices. So the services of functional specialists are required to guide the software professionals in the development of application software. The various stages of software development life-cycle, i.e., study, finalization of specifications, design, coding, testing and implementation, have to be meticulously assessed. Much effort is required to work out the above activities.

2. **Enhancing the capabilities in the existing system:** The existing non-integrated computerized business functions would be assessed for integration. Also, changes that need to be carried out would be ascertained from this exercise.

3. **Buying a ready-made package:** A ready-made package that has all the features required by a manufacturing enterprise, requires some amount of customization for effective use. If the product is of international repute, a business process reengineering (BPR) exercise needs to be carried out, because these products have been developed keeping in view of the business practices followed in their countries. The cost of customization has to be obtained from the suppliers.

4. **Engaging a software company:** It is essential to know the profiles of the software professionals who are going to be associated with the development of an ERP package, to suit the requirements of the user company. Some companies may have software developed for one of their clients, which in turn could be used with or without changes.

**Decision tree model**

Figure 1 presents the decision tree model, which facilitates the process of selecting one of the options mentioned, and can be explained with an example. The cost of software is an approximation.

Arriving at the cost for taking decision:

**Expected cost = (Path probability)i x (Estimated path cost)i where i is the decision tree path**

- **Expected cost __ build = 0.30 (380) + 0.70 (450) = Rs 429 lakh**
- **Expected cost __ reuse = 0.40 (275) + 0.60 (0.20 (310) + 0.80 (490)) = Rs. 382 lakh**
- **Expected cost __ buy = 0.70 (210) + 0.30 (400) = Rs. 267 lakh**
- **Expected cost __ contract = 0.60 (350) + 0.40 (500) = Rs. 410 lakh**

Based on the probability and projected costs the lowest cost would be the buy option.

**Hardware and system software**

Depending on the requirements of the application software, the cost of element of hardware, system software and networking has to be ascertained. The services of professionals may be sought for this exercise. Generally, two options available, viz.:

1. Enhancing the existing hardware (servers and nodes), replacing the existing system software and networking; and
2. Buying a new hardware (servers and nodes), buying a new system software and networking.

**ERP for small and medium organizations**

A major problem faced by Indian enterprises today is the lack of integration of data among different functions like finance, production, material and sales. This could be attributed to the fact that individual departments over a period of time to perform departmental tasks on installed PCs and no serious attempt was
made to integrate them. It is common to find companies having computers in stores, but not connected to the finance department. As a result, finance would enter data again in their financial accounting system and a host of people would be spending their time trying to reconcile the statement from the two departments.

Implication of lack of integration
In the early days when the enterprises were small, organizations had a customer focus. As they grew, the enterprises created different functions to manage the system more efficiently. Unknowingly, this created barriers among different functions and led to problems like:

1. The CEO has to struggle hard through many review meetings to ascertain the true status of key performance factors.
2. Department heads have become less sensitive to the enterprise-wide impact of what they do in their individual departments. For example, a production manager who is judged on increased equipment utilization does not bother about its adverse implication on inventory turnovers or work-in-progress build up.
3. Despite major investment in IT, people do not get the information they really need that, in turn, leads to the poor quality of managerial decisions.

Ultimately, all these affect the organization’s financial hygiene and general health.

 ERP is needed by all
Many multinationals restrict their business with only those companies that operate the same ERP software as the multinational firm. It is a fact that ERP is for big firms and smaller firms have to adjust their business model and approach according to the practices and software adopted by the big firms. The main problem is that there is no seamless interaction between the packages. Once purchased, has one to stick with it for a lifetime and make the best use of it. As per the statistics, big firms have to incur an implementation cost that is 15 times the product cost and takes over a year for implementation.

According to the International Data Corporation, India is expected to make distinct gains from the projected growth in ERP software applications market. The packaged application market in India and China totalled around US $78 million. The estimated compound annual growth rate of the ERP software market would be 29.5 per cent from 1998 to 2002. The growth rate is attributed to continued industrialization, further implementation and migration to client server architectures and the increasing technology adoption and greater availability of ERP applications for SMEs.
The cost of ERP solutions available in the Indian market ranges from Rs 1.5 lakh per user at the high end, to Rs 15,000 per user at the lower end. The customization and implementation costs have to be added. The total time required for a successful implementation would take anything from 12 to 24 months. One problem faced by Indian organizations is the mass exodus of trained IT professionals. The acutely affected ones are the SMEs, most of which are left with single manpower in ERP departments. This makes it necessary for such enterprises to go for an ERP product that attempts an in-house development.

A misnomer that has gained acceptance in the recent past is that ERPs are meant for large organizations. This statement is partly true. The ERPs marketed are expensive and smaller organizations cannot afford them. However, this does not mean that the SMEs do not need an ERP. In fact there is a greater need for information integration in SMEs that lack the money power and business resilience of large enterprises. The need of the hour is to provide micro ERPs, i.e. near ERP capabilities build into a product and sold at an affordable price, including implementation.

The available ERP solutions include SAP, PeopleSoft, Oracle, Baan, JBA Systems, Ramco, etc., meant for the higher end market. The middle end products include SSA, BPCS, JD Edwards, Inertia Movers, etc., and offer good functionality and could be implemented faster. The low end products like QAD, MFG, PRD, etc., could be implemented very fast, but offer limited functionality.

Criteria for selection
SMEs should look for and demand that they get a software package that meets the following criteria:

1. Affordability – attractive prices, including implementation support.
2. Domain knowledge of suppliers – it is important that the software developer or supplier knows the industry and is willing to implement the software for the industry. If the industry is a manufacturing enterprise, procure the software from people who have the experience in manufacturing industries.
3. Local support – low end software packages developed abroad and sold in India are not likely to be adequately supported with regard to implementation. For effective implementation, such packages would need more support from suppliers both in terms of IT expertise and domain knowledge.
4. Technically upgradable – ensure that the suppliers undertake to upgrade the products to make best use of technologies that are likely to become available in the future. With the advent of Internet, Intranet, EDIs, the ability to upgrade is important. Obviously, no supplier would do it free. But a contract that binds the supplier to do it for an annual cost of say, 15 percent of the software, is indeed worthwhile.
5. Uses latest technology – it is useful to choose a product that is designed based on object-oriented technology and GUI. These are easy to implement, user-friendly and amenable to modifications in future.

Case study
The National Institute for Industrial Engineering organized a study of the current usage of IT generic capabilities, ERP and BPR implementation in Indian industries during 1998. A questionnaire was designed and mailed to 4,185 engineering and process industries listed in the Mira Industrial Directory. A total of 165 responses were received.

Regarding ERP implementation, 76.9 per cent of the respondents had not installed ERP. In 8.5 per cent of the companies, ERP has been recently installed. In 5.5 per cent of the companies, ERP has been installed but is facing a lot of teething problems. Only in 3.6 per cent of companies has ERP been successfully implemented. The percentage of companies not responding to the queries with respect to ERP implementation is 5.5. It is seen that a larger number of companies in India are yet to exploit the power of IT through implementation of ERP and derive the associated benefits.

With regard to BPR implementation, 23.6 per cent of the respondents launched a BPR exercise. The percentage of companies successful (achieving more than 30 per cent improvement) in BPR endeavors is 43.6 per cent. The majority of companies in India have yet to launch a BPR movement and derive the benefits.

Regarding BPR with ERP, the percentage of BPR companies that have installed ERP is 25.6. Out of that, 5.1 per cent of organizations are facing a lot of teething problems and 7.7 per cent of companies have successfully implemented ERP. A large number of organizations (58.9 per cent of the BPR companies) which have gone for BPR have yet to install ERP. The percentage of BPR companies not responding to queries with respect to ERP is 2.7.
As regards to ERP status in non-BPR companies, 82.5 per cent have not installed ERP. In 5.5 per cent, ERP is facing a lot of teething problems. On the other hand, 3.3 per cent have already installed ERP and only 2.3 per cent have been successfully installed. The percentage of non-BPR companies who have not responded to queries with respect to ERP is 6.4.

With regard to ERP and successful BPR, only one of the 17 successful BPR companies has implemented ERP successfully. Indian companies must understand the potential of ERP in redesigning business processes. In 17.6 per cent of the successful BPR companies ERP has been recently installed. The percentage of successful BPR companies facing a lot of teething problems after installation of ERP is 11.8. On the other hand, 64.7 per cent of the successful BPR companies have yet to install ERP. These companies through ERP implementation could enhance the degree of benefit achieved through BPR implementation.

**Conclusion**

The waves of change brought by ERPs have begun to be felt and appreciated by organizations worldwide. Customer-focused applications and analysis have begun moving from theory to implementation by creative, innovative and motivated organizations because they have realized that in today’s environment measuring customer profitability and organizing to retain customers provide a tremendous and unbeatable strategic advantage.

Suppliers who are offering ERP systems on client-server technologies are now looking at the impact of Internet-based technologies. During this initial phase, ERP products would be “Internet-enabled” in at least a portion of the systems offered. With the opening up of the economy, SMEs have found the going rather tough indeed. Since they do not have the robustness associated with large companies, SMEs have to tap the power of IT and an integrated information system to stay competitive and customer oriented. ERP is the answer for their survival.

**Further reading**


