Thesis on
IMPLEMENTATION OF ENTERPRISE RESOURCE PLANNING (ERP) SOFTWARE AND ECONOMIC ANALYSIS OF ITS IMPLEMENTATION IN INDIAN MULTINATIONAL ORGANISATIONS”

Submitted for the award of
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Degree in
Business Management
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MODIPURAM, MEERUT-250110 (INDIA)
2011
DECLARATION

I, hereby, declare that the work presented in this thesis, titled “IMPLEMENTATION OF ENTERPRISE RESOURCE PLANNING (ERP) SOFTWARE AND ECONOMIC ANALYSIS OF ITS IMPLEMENTATION IN INDIAN MULTINATIONAL ORGANISATIONS” in fulfillment of the requirements for the award of Degree of Doctor of Philosophy, submitted in the School of Business Studies at Shobhit University, Meerut is an authentic record of my research work under the supervision of Prof.(Dr) Anoop Swarup and Prof.(Dr) DPS Verma.

My indebtedness to other works has been duly acknowledged at the relevant places.

Vishal Bishnoi

Date:

Place: Meerut.
PREFACE

Every operation in a modern organization relies heavily on timely and accurate information to survive in today’s competitive market. In fact, Information System serves as the life-line to the organizations, no decision can be taken without information and thus the organizations are using Enterprise Resource Planning Software (ERP) for gaining competitive edge over their competitors.

The ERP software integrates all functional areas of business, including sales, logistics, billing, production, inventory management, quality, and human resources management, into one organisation-wide system. Enterprise Resource Planning systems may be considered as one of the most important development in the application of information technology in the business world.

This integrated approach has a tremendous payback if companies properly install this software. In spite of all these advantages, the success rate of the ERP software implementation project is very low. Earlier studies have revealed that software implementation failure include implementation time overruns, budgeted implementation cost overruns, and ineffective changeover management.

Though many studies have been conducted on the ERP Implementation and its various dimensions in the world, yet they do not focus on to the Indian multinational organisations in particular and peculiar Indian organisational environment in which the ERP software is to be implemented and has to operate. This study seeks to analyse a techno-economic view of the ERP software implementation. The focus of this study is not merely on the technology per se but is also on the selection and implementation strategies, as well as implications of the software towards organisational effectiveness.

The study will also examine the usefulness of the ERP system’s functionality assessment, effective use of Enterprise Resource Planning for achieving cost effectiveness in all organisational processes, and for supporting the knowledge management functions from the Indian Multinational Companies’ perspective.
The Case studies of selected Indian Multinational Companies is used for analysis, along with some empirical investigation with respect to ERP system’s utilisation in organisations covering the various financial aspects of Enterprise Resource Planning software implementation including Cost-benefit analysis, significance test to check its impact on major organisational costs, impact of ERP implantation on the net margins and Critical Success Factors for the software implementation.

Acknowledgements

I am very grateful to all those who have helped me in carrying out the study. Their efforts and guidance have certainly shaped the study.

The study has been carried out under the able guidance of Prof.(Dr) Anoop Swarup, Vice Chancellor, Shobhit University, Meerut and Prof.(Dr) DPS Verma, Advisor, Shobhit University, Meerut. I wish to express my deep and sincere gratitude to both of my guides. Their wide knowledge and logical way of thinking have been of great value for me. Their understanding, encouraging and personal guidance have provided a good basis for the present study.

I am also thankful to the Director and the Faculty members of School of Business Studies, Shobhit University, Meerut, for providing necessary support from time to time.

During this work, I collaborated with many colleagues and professionals from Industry for whom I have great regards. I also wish to extend my warmest thanks to all those who have helped me in completing my work directly and indirectly.

Meerut
September

(Vishal Bishnoi)
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Chapter 1

CONCEPTUAL FRAMEWORK OF ERP SOFTWARE

1.1 Basic Concepts
1.2 Major Modules of ERP Software
1.3 Merits of ERP Software
1.4 Limitations of ERP Implementation
1.5 Evolution of ERP System
1.6 Market Scenario of ERP Software
1.7 Rationale for Selecting Indian Multinational Companies
1.1 Basic Concepts

In recent years, many organizations have initiated Enterprise Resource Planning (ERP) system using software packages like SAP, Oracle, BAAN etc. The Enterprise Resource Planning software market is one of the fastest growing market in the software industry (Mary Sumner, 2006). The figure given below represents the estimated revenue of Enterprise Resource Planning software market from 2006 to 2011 (AMR Research Report 2007).

Figure 1-1: Revenue estimates for Enterprise Resource Planning software market, 2006-2011

![Revenue estimates for Enterprise Resource Planning software market, 2006-2011](figure)

Source: Adapted from AMR Research Report on ERP Market, 2007

The term ‘Enterprise resource planning’ has been derived from Manufacturing Resource Planning (MRP II) that followed Material Requirements Planning (MRP). ERP software is cross-functional and organization-wide, it typically handles the manufacturing, logistics, distribution, inventory, shipping, invoicing, and accounting functions of a company.

Enterprise Resource Planning (ERP) software integrates all functional areas of business, including sales, logistics, billing, production, inventory management, quality management, and human resources management into one organization-wide system. Enterprise Resource Planning systems are some of the most important development in the application of information technology in the business world. Enterprise Resource Planning software serves as the information backbone to the core business processes of an organization. (Forger and Gary 2000); (Campbell, 2000). Companies have understood the importance of Enterprise

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Resource Planning software and hence more and more companies are implementing the software, making it one of the fastest growing segments of the application software market.

Today, every aspect in modern organization relies heavily on information to survive, in fact, information system serves as the life-line to the organizations, nothing moves without information and the organizations are using ERP for gaining competitive edge in all functional areas. ERP is a single software program that serves the needs of firm in all functional areas of an organisation. Each of the department typically has its own computer system optimized for the particular requirement of the department and ERP combines them all together into single, integrated software programme that runs on a single database so that the various departments can easily share information and communicate with each other.

ERP software is one of largest expenditure of corporate information technology (IT) budgets (Cissna, 19985 and Somers and Nelson, 2001)6. The core idea of implementing an ERP solution is to get tangible business benefits that would improve the performance of the organisation and achieve certain business objectives. This includes inventory reduction, less time to market, reduce manufacturing and order processing cycle times, etc. It is unbelievable but true that not a single ERP implementation in India has reached the stability. Most of them still seem to be in a half baked stage where the organisations have been unable to respond to the stringent demands and discipline required by the ERP packages. The fact that implementation of the world-class packages requires tremendous effort in enforcing change management coupled with the inability of these firms to respond to that challenge have compounded their problems further.

Thus, it has become critical to deliver value out of these implementations and in a reasonably short time, so as to justify the large investment made. The three key issues that could determine the success of an ERP implementation and work towards delivering quicker, better ROI are functionality, technology, and implementation of solution.

**Functionality:** The ability of the package to support the best business practices followed in the company's line of business would be a crucial factor in determining the smoothness of implementation. Major gaps in required functionality can lead to time-consuming and cumbersome customisations which could put time-schedules and budgets off track. A focused evaluation exercise at the selection stage would help towards eliminating incompatible choices. The quality and commitment of business consultants and product consultants involved in the ERP implementation would also be a very crucial factor in ensuring its success.

**Technology:** Scalable ERP solutions that support open, non-proprietary technology standards would provide for protection of investments and ensure minimal risk. They should support different kinds of operating systems, database management systems and operate on most major client/server hardware platforms, local area networks (LANs), and user interfaces (ASCII, Motif, Windows 95, etc.) so as to minimise risk towards technology obsolescence. The ERP package's programming language software development tools should permit ready adaptation of the system in response to ongoing changes in production and operational processes. The development tool-set for the applications should be easy-to-use to minimise customisation effort and time.

**Implementation of the Solution:** This, in my opinion, should be the most crucial and significant factor as customer satisfaction and benefits of ERP would depend not only on functionality but also on ease-of-configuration, ease-of-use and the software's flexibility to support optimisation of business processes.

Much of the complexity of a software implementation process has also much to do with setting of parameters, designing menus and authorisations. The roles and responsibilities of different employees have to be clearly identified, understood and configured in the system. The involvement and willingness of the employees to accept and use these new procedures laid by the ERP would determine the success of the implementation to a great extent.

Simple, easy-to-use processes and procedures go a long way in creating user trust and confidence. There have been ample instances of large and complex packages failing to
deliver on implementation because of the misgivings users had in terms of difficulty of configuration and usage.

When organisational changes take place, the software solution should grow and adapt to the changing demands of information needs. For example, no longer can a manufacturer of hard-drives in Taiwan with a product life cycle of six to nine months take 12 months to implement an ERP system and then wait another six months to derive these benefits. The ability of the ERP package to manage and support dynamically changing business processes is a critical and vital requirement for the organisation.

This integrated approach has a tremendous payback if companies install the software correctly. Typically, when a customer places an order, that order begins a mostly paper-based journey from in-basket to in-basket around the company, often being keyed and re-keyed into different departments' computer systems along the way. All that lounging around in in-baskets causes delays and lost orders, and all the keying into different computer systems invites errors. Meanwhile, no one in the company truly knows what the status of the order is at any given point because there is no way for the finance department, for example, to get into the warehouse's computer system to see whether the item has been shipped. "You'll have to call the warehouse" is the familiar refrain heard by frustrated customers.

Figure 1-2: An integrated view of Enterprise Resource Planning System


An ERP system that if properly implemented, can achieve high benefits for business. However, some companies have difficulty identifying any measurable benefits or business process improvements (James and Wolf 2000)\(^8\); (Donovan 2001)\(^9\). It is further reported that a large number of ERP implementations fail to meet expectations (Stefanou 2000)\(^10\) as many adopters have not yet realised the benefits they had anticipated.

Many organisations have not yet realised the benefits they had anticipated. For example, Pallatto in 2002\(^11\) commented that some vendors and consultants are presently ‘soft-pedalling’ the term ERP due to bad experiences and management frustration. In a recent product brochure titled ‘Optimise your ERP Investment’ by Cap Gemini Ernst and Young (CGEY), CGEY mentioned that “most companies have high expectations from ERP system implementations, however, some of them fail to achieve all the benefits that were anticipated. In fact, many ERP implementation projects result in high dissatisfaction levels because of many operational glitches and limitations”. Report also stated that “the ERP implementation gives sight of business potential but may not deliver much of the expected value”. Mr. Hendrickson also supported the argument, he said that “organisations that have developed their design from a clear understanding of business requirements shall be able to gain more value from their ERP implementation”.

Rutherford (2001)\(^12\) observed that only around 10% to 15% of ERP implementations deliver the anticipated benefits. According to James and Wolf (2000)\(^13\) companies that were able to identify benefits, thought they could have been realised without the implemented ERP system. “80 percent of the benefit that we get from our ERP system comes from

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\(^13\) Ibid , James and Wolf
changes, such as inventory optimisation, which we could have achieved without making the IT investment” (James and Wolf 2000)\(^{14}\).

However, in addition, according to James and Wolf (2000)\(^{15}\), reporting on an instance of an ERP implementation, “many of the benefits that they were able to achieve today could not have been predicted at the time they started work on ERP. In fact, in hindsight it appears that much of the value of these large systems lay in the infrastructure foundation they created for future growth based on Information Technology”.

Overall, despite the strong push towards ERP, there is, in relation to ERP implementations, a lack of understanding of the difficulties that can arise when the business models used by organisations clash with the business models underlying the ERP packages implemented by these organisations. There seems to be a subtle but profound danger that the logic of the software package supplants the organising logic of the organisation as a whole.

There is also significant evidence that the disruption to everyday business while ERP systems are implemented are putting undue pressure on organisations, regardless of their size and financial means. For example, Dell Computers, after months of delay and cost over-runs, abandoned their ERP project because they found that the new system was not appropriate for its decentralised management model (Stefanou, 2000)\(^{16}\).

**Important Definitions:**

Enterprise resource planning (ERP) software attempts to integrate all departments and functions across a company onto a single computer system that can serve all those different departments' particular needs.

An ERP system is an integrated software package composed of a set of typical functional modules such as Production, Sales, Human Resources, Finance, Logistics etc. developed and integrated by the vendor, which can be adapted to the specific needs of each

\(^{14}\) Ibid, (James and Wolf 2000)  
\(^{15}\) Ibid  
\(^{16}\) Ibid, (Stefanou, 2000)
customer. It attempts to integrate all departments and functions across a company onto a single Database Management system that can serve information needs of all departments.

ERP solutions are enterprise wide and aim at optimal utilization of organizational resources. ERP solutions also facilitate tasks beyond resource planning such as financial control, operational management, analysis, reporting, and routine decision support. ERP systems empower the top, middle, and bottom of the organization hierarchy by facilitating centralized information access. Some of the important definitions are given as below:

a) “ERP is a business model framework for planning all of the resources of a business—starting with strategic planning and linking through to execution. Process disciplines are integral to successful ERP predictability, and management systems can provide accountability. ERP systems are the information technology tools or software for which some of these process links can become automated, with information shared across functional areas and business transactions efficiently processed.” (APICS Operations Management Now, August, 2009)

b) The Enterprise Resource Planning (ERP) system is an enterprise information system designed to integrate and optimize the business processes and transactions in a corporation. (Young B. Moon, 2007)

c) ERP links all areas of a company with external suppliers and customers into a tightly integrated system with shared data and visibility. ERP systems are designed to solve the problem of the fragmentation of information over many legacy systems in large business organizations (Chen, 2004)

d) “Enterprise Resource Planning (ERP) systems are “computer-based systems designed to process an organization’s transactions and facilitate integrated and real-time planning, production, and customer response” (O’Leary, 2000).

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e) Enterprise Resource Planning (ERP) Systems can be defined as customizable integrated application software that supports the core business processes and the main administrative areas of enterprises of different industries/ (Klaus et al. 2000)20

f) The American Production and Inventory Control Society (APICS) defines ERP as “an accounting oriented information system for identifying and planning the enterprise-wide resources needed to take, make, ship, and account for customer orders”. (Watson and Schneider, 1999)21

1.2 Major Modules of ERP Software

i. Accounting Module

Any successfully ERP implementation begins and ends with an efficient accounting software. From the initial launch process of establishing general ledger entries, account numbers thorough the final accounts statements and financial statements is the core of any enterprise and a quality ERP package with strong accounting software functionality that is both flexible and easy to use is a great support.

Within an ERP system, the accounting software modules manage the recording and processing of accounting transactions within functional areas such as accounts payable, accounts receivable, and payroll. These functional areas and their corresponding sub ledgers feed transactions into the general ledger from where financial reports are generated for management and external stakeholders.

In addition to transaction and function, it ultimately helps to validate the general ledger for final review and analysis. Therefore, ERP solution implementation with accounting software module is vital to the project’s overall success.

ii. Business Intelligence Module

Business intelligence module provides Enterprises with the ability to make effective and relatively fast decisions due to the availability of reliable and easy to understand information. Standard business intelligence software functionality includes a decision

support system driven by an attached data warehouse. This data warehouse feeds management with real-time access to ad hoc reports, online charts and tables, as well as graphical dashboards that offer a range of information in the form of financial reports, and key performance indicators.

Many ERP solutions provide real-time business intelligence capability that is available for data mining and financial analysis. With this module data can be viewed in summary form with the option to zero down to a detail level to investigate concerns or potential anomalies. This advanced business intelligence provides a 360-degree view the organization’s overall health and helps to the executive staff with the tools necessary to make better and faster decisions.

Business intelligence software is available with stand-alone packages and as modules within Tier I, II, and III ERP solutions. ERP consultants help should be sought to evaluate an organization’s reporting needs to evaluate if an integrated solution or stand-alone solution is best to meet the company’s reporting needs.

### iii. Customer Relationship Management (CRM) Module

Customer Relationship Management software or CRM software module supports front office operations and the customer service, sales, and marketing functions. CRM software is available as stand-alone software packages and in more recent years, it is becoming a primary component of both Tier I and Tier II ERP software solutions.

In mid-market or higher end ERP systems fully integrated module of CRM with other ERP modules such as manufacturing, warehousing, and purchasing enables real-time access to data that help by enhancing the marketing efforts. CRM software functions of next generation may assist in activities such as quoting, support call management by providing more a comprehensive data set to allow the sales and marketing team to behave in a more predictable and proactive manner. This integrated approach to CRM software will assist organizations in delivering high levels of customer service and ultimate customer satisfaction.
iv. Distribution Management Module

When a company is operating in wholesale distribution environment, distribution management software will be at the heart of that ERP system. However, all ERP software solutions have distribution software functionality, not all ERP solutions offer robust enough features to manage complex distribution channels.

A wholesale distribution company will be concerned with software functionality that focuses on maintaining optimal inventory levels, facilitating quick movement of goods, providing strong front office functionality for customer service personnel, and delivery flexible reporting for management. The ERP module must look beyond simple features and expand into validating if the distribution software functionality offers advanced features such as fully-integrated. In addition, many wholesale distributors clients require strong supply chain management capabilities that can manage advanced planning, merchandise importing, and distribution requirements planning (DRP) for centralized purchasing environments and multi-warehouse distribution channels.

v. Order Management Software

Regardless of the industry segment, order management software functionality is key to an organization’s success. A large portion of many ERP software selection projects is dedicated to documenting order entry requirements and reviewing an ERP supplier’s order management software functionality.

Order management software drives order processing and fulfillment by facilitating quick and accurate sales order entry. In many business environments, this functional area is a critical piece of the overall operations. Since order management requirements vary greatly by industry, an ERP solution’s available functionality will quickly short-list or eliminate potential ERP software vendors. High-end functionality like online product configuration, available to promise data, and multi-facility sales orders will differentiate one solution provider from another. Documenting must have features within the order management software will be required for driving the ERP selection project to ultimate success.

vi. Inventory Management Module

The Inventory Management Module functionality is a critical component of ERP software solutions as the inventory control module interacts practically with many other
module of functional area. From the purchase indent through sales order entry through purchasing and receiving to shipping and ultimate invoicing, strong inventory management software is necessary to provide high order fill-rates, contain operational costs, and maintain profit margins.

Inventory management requirements vary by industry, although critical inventory control features easily differentiate stronger ERP software packages from their weaker counterparts. **Discrete manufacturing** environments generally require multi-level serial number tracking, attributed inventory, revision level tracking, and kitting capabilities for value added distributors. **Process manufacturing** environments will typically need lot control and lot property tracking, complete backward and forward traceability of lot numbers, expiration date management, and multiple units of measure per product. **Mixed-mode manufacturing** environments become even more difficult, since organizations will require a combination of both process and discrete inventory management software features. Regardless of the environment itself, it is important to document all inventory management software requirements and compare these needs against available ERP packages.

vii. Financial Management Module

A quality Enterprise Resource Planning software solution will include strong financial management module that is fully integrated with the organization’s core functional areas of manufacturing, shipping and receiving, and sales order management. In robust Enterprise Resource Planning systems, the transactional data generated from these departments will be available for immediate review via online inquiries, ad hoc reports, and real-time dashboard data. These capabilities offer full financial visibility into the organization’s payables and receivables with up-to-date access to inventory levels and sales forecasts. This transparency will provide accounting personnel and the executive staff with real-time financial data that helps facilitate quick, yet highly informed business decisions.

All Enterprise Resource Planning vendors including Tier I to Tier III of ERP software, should include comprehensive tools for managing all aspects of accounting transactions, budget management, multi-currency transactions, revenue recognition and management, account allocations, taxation, financial reporting, and compliance management. In addition, the financial management software should also support full audit
capabilities to provide complete backwards and forward traceability to each and every transaction.

viii. **Human Resources Management Module**

It is often said that an organization’s most valuable resource is its workforce. This requires observing the best human resource management software (HRMS). HRMS is critical as managing the complexities of talent, payroll, and government regulations should not be left to manual processes. Enterprise Resource Planning system that can effectively manage the day-to-day operations, as well as the needs of the human resources department, is important for an Enterprise Resource Planning project’s overall success and ultimate Return on Investment (ROI).

Strong human resource management module capability will keep employee data in a secure manner, while also providing quick access to the employee’s complete employment information. Robust human resource software will offer compliant processing of employee payroll, taxes, and benefits and send all applicable transaction data to the financial management and business intelligence software modules.

ix. **Manufacturing Management Module**

The ‘Production and Operations management’ software is very important for manufacturing oriented companies, their requirements for manufacturing software functionality will be the core of any ERP software. Though there are stand-alone manufacturing software packages available on the market, yet the best manufacturing solutions can be tightly integrated into a centralized ERP system.

The features of manufacturing software vary based on the industry product and the production process utilized. Most ERP and manufacturing solutions are placed into the categories of process manufacturing software, discrete manufacturing software, or mixed-mode manufacturing software. These different manufacturing categories directly relate to the production environment and whether this environment can be classified as continuous process, contract manufacturing, job shop, batch processing, repair and maintenance, repetitive, or work order based. Understanding an organization’s production environment
and matching the operational flow to an ERP software package with the proper manufacturing software functionality is critical for project success.

x. **Point of Sale (POS) Module**

Retailers rely on their ERP system’s POS software or point of sale module to deliver an easy to use interface that can be quickly deployed to a single store location or hundreds of stores and retail outlets. Large or small, a POS software solution needs to be tightly integrated with the inventory management software and produce timely information for individuals across the enterprise.

Robust POS software offer tools to easily configure the solution to meet the retailer’s sales requirements. Common POS software functionality includes category management, multi-level pricing structures, promotional management, and flexible payment options that accommodate credit cards, gift cards, and layaway options.

xi. **Planning Module**

Manufacturers and distributors rely on their ERP system’s planning module to optimize the delivery of incoming materials and the movement of inventory between facilities. With efficient planning, manufacturers can reduce raw material inventories and increase production output, while distribution companies can significantly reduce transportation costs and improve customer responsiveness and overall satisfaction.

For manufacturers, planning software functionality will include Material Requirements Planning (MRP) process and capacity requirements planning (CRP). The MRP process focuses on criteria such as lead-time that yields, scrap rates, batch sizes, and bill of material or formulas.

The CRP process focuses on work center schedules, labor requirements and efficiencies, machine set up times and maintenance schedules, similar with many other areas within the ERP package, the organization’s planning software requirements will vary based on the industry and manufacturing environment.

In distribution companies, the planning software functionality of MRP is replaced by the Distribution Requirements Planning process (DRP). The DRP process will review criteria such as warehouse dependencies, vendor lead-times and order multiples, an item’s desired service level and other constraints such as container requirements and transit times if
purchased from overseas. When integrated into an ERP system, planning software functionality becomes imperative for leveraging demand requirements and optimizing these needs to produce the highest levels of order fill-rates and on-time deliveries.

xii. Service Module

For the service industry, the terms ‘service module’ and ‘ERP software’ are used interchangeably. While there are a number of ERP solutions that include service software functionality, not all ERP packages offer functionality capable of managing the needs of contractors or professional service companies. Due to this, service organizations must take additional care in documenting their service software needs and comparing these requirements to prospective ERP vendors.

Because professional service companies and field service operations have unique processing needs that differ from that of standard manufacturing software or distribution software, the ERP selection process must focus heavily on the needs of the service personnel. A best of breed service software package or module would include features such as help desk support, ticket entry and management, technician dispatch, field service repair, spare parts management, in-house repair, maintenance contracts, and job-based estimates and billing.

xiii. Software as a Service (SaaS)

‘Software as a service’ software (SaaS software) is a method of deploying ERP software in a hosted or on-demand environment. Unlike the traditional method of purchasing ERP software licenses, the software as a service software model allows for the ERP software package to be rented or licensed for a protracted period of time. The ERP software is either hosted on the ERP developer’s web server or via a third-party provider commonly referred to as an ASP or application service provider.

While there are many advantages to the software as a service software model, this type of ERP software is not ideal for every organization. The SaaS software model offers a lower cost entry point and provides additional benefits such as reduced time to implement, limited need for technical support and infrastructure, and a more predictable expenditure cycle.
On the converse, the software as a service software model includes disadvantages that must be reviewed as part of the ERP business case. Not all ERP software vendors offer a SaaS software model and those that do may limit the ability to customize the software. This can limit the available options for ERP software and deter those organizations that prefer a highly customized ERP solution.

xiv. Supply Chain Management (SCM) Module

The Supply chain management module supports the management and movement of raw materials, work-in-process inventory, and finished goods from a given point of origin to the ultimate point of consumption. These supply chain activities help build the backbone of the organization’s cost structure and ultimate profitability. As such, strong supply chain management software functionality is critical for successful companies and therefore a core concern for many ERP software selection projects.

In more recent years, many organizations have shifted their operations to include more importing of goods and are therefore much more reliant on overseas suppliers. This change has placed greater emphasis on long-term planning and procurement of raw materials and distributed goods. This has forced many companies to reconsider their existing supply chain management software functionality and evaluate the strength of their existing ERP software or legacy systems.

In doing so, organization begin to expand their usage of supply chain management software and rely on ERP solutions to control all aspects of distribution requirements planning, purchasing, import management, containerization tracking, supplier relationship management, and controlling the movement of goods between their internal warehouses and distribution centers. The most robust of ERP systems will help tackle supply chain management issues, reduce supplier lead-times, and control inventory while also delivering the highest level of sales order and line fill-rates for the end user customer or value added distributors.

xv. Small Business Management (SBM) Module

The Small Business Market is full of organizations that have outgrown their entry-level small business software and are in need of migrating to more robust software solution. Tier II and Tier III ERP developers are embracing these companies and helping these small
businesses upgrade their QuickBooks and Peachtree accounting software to more advanced ERP systems.

Increased regulatory compliance and big-box retailer expectations have forced companies to trade in their small businesses software for ERP packages that manage more sophisticated requirements such as FDA compliance, lot tracking, bar-coding, and EDI transactions. The increased ease of use in ERP software packages and the onset of the software as a service software model have made this transition more feasible for the small business owner.

With this evolution, the phrase small business software now refers to those ERP software packages that are designed for the SBM market. This change has delivered tangible return on investment through increased automation, paperless warehouse capabilities, comprehensive cost information, and ad hoc reporting. And more importantly, it has made the movement from QuickBooks and Peachtree accounting software to an integrated ERP system possible.

xvi. Warehouse Management Systems (WMS) Module

Warehouse management systems (WMS) are available as stand-alone WMS software packages and as integrated modules within many ERP solutions. Strong warehouse management systems will reduce costs and improve customer satisfaction by providing warehouse personnel with the tools necessary to optimize the warehouse and thus operate at the highest level of efficiency.

Warehouse management systems offer benefits such as increased inventory accuracy, streamlined order picking and shipping, reduced fulfillment cycle times, and greater customer satisfaction through increased order fill-rates and greater on-time deliveries. When warehouse management systems are integrated modules within an ERP system, the WMS module is an integrated part of the overall enterprise system and thus provides a transparent view of warehouse activity that is available for viewing by purchasing, sales, accounting, and the executive staff.
A study conducted by Sammon and Lawlor (2004)\textsuperscript{22} argues that, highlighting a failure to carry out an analysis of the mandatory and desirable features required in a system with an open mind will lead to the blind acceptance of the models underlying the ERP packages.

1.3 Major Merits of ERP system

i **Reduction of Operating Cost:** ERP systems have large-scale business involvement, internal and external process integration capabilities. They can assist in achieving the strategic competitive advantages. With a centralized database and built in data analysis capabilities, ERP systems provide informational benefits to management decision making. As ERP systems automate business processes and enable process changes, an organization may expect ERP systems to offer strategic advantage through **Cost leadership** by Cycle time reduction, Productivity improvement, Quality improvement, Customer services improvement.

ii **Improved Job Time:** As the different parts of the organization are connected with each other, people have faster access to information and require less time to do their tasks. This helps to improve the time and resources for decision-making

iii **Centralization of Information System:** As all the departments and the functions in the organization are integrated and linked to one single database, data needs to be entered only once into the system. It can then, be accessed by different departments according to their needs. For example, before taking an order from a customer, the sales representative can have access to information regarding availability of inventory, credit rating of the customer, etc.

iv **ROI earlier than the software developed in-house:** Developing software in-house requires a great amount of investment, experienced professionals and tremendous amount of time. The payback from the in-house system takes an equally longer time. As ERP software packages are developed by vendors who have the required expertise, they are basically off the shelf packages that companies pick up that

require minor customizations as per company requirements, and so they don’t involve an in-depth development like the in-house software. Hence the ROI is received faster from the ERP system.

v **Ease of use:** The system of ERP is very user friendly. With the correct amount of training, it becomes easy for the employees to use the system.

vi **Efficient business practices:** The ERP system helps companies to do away with the erroneous ways of carrying out the different business functions and introduces business best practices. This further helps to provide better control and introduces standardized ways to execute business processes.

vii **Ready-made elucidation for most of the problems:** Most of the problems get resolved as the vendors who develop ERP software packages, take the best ideas from all their customers and incorporate them into their products.

viii **Only customization required:** ERP Systems are already developed to suit the general businesses. But as every company has a slightly different way of operating, only minor changes may be needed to customize the system to suit the company’s particular business requirements.

ix **Easy enterprise wide information sharing:** Once the information is entered into the single database, everyone in the organization has access to the information and sees the same computer screen.

x **Customer satisfaction:** In the paper-based system, the order moved from basket to basket around the organization, and often caused delays, errors in processing due to repeated entries by the different department or got lost. With the ERP system, the order process moves quickly through the organization. This helps to get the orders to the customers faster and there is no in-basket time waiting time involved.

### 1.4 Major Limitations of ERP Implementation

Many of the problems that companies face with ERP system are due to inadequate investment in training of all relevant personnel, including those implementing and testing changes, and setting corporate policies. There are limitations and pitfalls to ERP, for instance:
i) Success depends on the skill and experience of the work force, including education in how to make the system work correctly. Many companies attempt to cut implementation costs by cutting user training. Privately owned small enterprises are often sufferer, their ERP system is often operated by personnel with inadequate education in ERP in general.

ii) Personnel turnover; companies can employ new managers lacking education in the company's ERP system.

iii) Proposing changes in business practices that are out of synchronization with the best utilization of the company's selected ERP.

iv) Total cost of ownership of ERP systems is very high.

v) ERP vendors can charge sums of money for annual license renewal that is unrelated to the size of the company using the ERP or its profitability.

vi) Technical support personnel often give replies to callers that are inappropriate for the caller's corporate structure. Computer security concerns arise, for example when telling a non-programmer how to change a database on the fly, at a company that requires an audit trail of changes so as to meet some regulatory standards.

vii) ERPs are often seen as too rigid, and difficult to adapt to the specific workflow and business process of some companies - this is cited as one of the main causes of their failure.

viii) The system can suffer from the "weakest link" problem - an inefficiency in one department or at one of the partners may affect other participants.

ix) Many of the integrated links need high accuracy in other applications to work effectively. A company can achieve minimum standards, then over time "dirty data" will reduce the reliability of some applications.

x) Once a system is established, switching costs are very high for any one of the partners (reducing flexibility and strategic control at the corporate level).

xi) The blurring of company boundaries can cause problems in accountability, lines of responsibility, and employee morale.

xii) Resistance in sharing sensitive internal information between departments can reduce the effectiveness of the software.
There are frequent compatibility problems with the various legacy systems of the partners.

The implementation of an ERP system involves a complex set of tasks, from selection and system design, to installation, tuning, maintenance and upgrade. The core set of technologies and capabilities needed to accomplish these tasks is often not obtainable in-house, due to high costs and lack of resources. This means that ERP customers must find ways to engage top-notch ERP experts while controlling costs and still be able to implement and maintain a strategic ERP system. Handing off all or part of the responsibility for implementation and maintenance - also known as ERP outsourcing - is an increasingly viable and important option for ERP customers.

1.5 Evolution of ERP Software

Enterprise Resource Planning solutions appeared on the market in early 1980’s. ERP software comprise of business modules for Finance, Logistics and Manufacturing, allowing for the management of purchases, sales, stocks, production etc. These solutions were referred to as Enterprise Resource Planning since they permitted the stage elaboration and integrated administration of the company major resources (inventory and materials, human resources, and finance) and the associated processes.

The term Enterprise Resource Planning (ERP) is the successor to MRP II, and MRP II is a successor to the Materials Requirement Planning (MRP-I) software that resulted from requirements for greater control and efficiency in manufacturing systems.

The original ERP systems ran on mainframes and IBM AS/400 systems, and included mainframe products such as SAP R/2 and MAPICS, from Mapics Inc., as well as AS/400 packages such as J.D. Edward's World and SSA's BPCS.

While ERP had its origins in manufacturing and production planning systems, the scope of ERP offerings expanded in the mid-1990s to include other "back-office" functions such as order management, financial management, warehousing, distribution production, quality control, asset management and human resources management. The range of
functionality of ERP systems has further expanded in recent years to include more "front-office" functions, such as sales force and marketing automation, electronic commerce, and supply chain systems.

Enterprise Resource Planning solutions appeared on the market from the early 1980’s. Generally they comprised modules for Finance, Logistics and Manufacturing, allowing for the management of purchases, sales, stocks, production etc. Before ERP, the purchased or in-house developed software were the only solution offered to companies to manage their activities between departments, tasks, input and databases. In order to appreciate the evolution of ERP system, it is useful to go back to the first classification of systems and the most referenced framework for the implementation of management information systems, given by Gorry and Scott Morton (1971)\(^\text{23}\). They developed a framework that has become the foundation stone for much of the research work in Decision Support Systems (Kirs, et al., 1989)\(^\text{24}\).

The framework allows an organisation to gain a perspective on the field of Information Systems and focuses on understanding the ‘evolution of MIS activities within organisations’, and recognises some of the potential problems and benefits resulting from ‘new technology’.

The Gorry and Scott Morton framework is perhaps the best known, most durable and most frequently cited in the IS field (Kirs, et al., 1989)\(^\text{25}\). Gorry and Scott Morton (1971) in their report on their general observations about the different categories of management activity (strategic planning, management control, operational control) highlighted the information requirements to support these activities.

This gives the reason why many organisations have found it increasingly difficult to realise some of their long-range plans for information systems, however, many of these plans are based on the "systems approach". Some of the proponents of this approach


\(^\text{25}\) Ibid, Kirs et al., 1989
advocate that systems throughout the organisation be tightly linked, with the output of one becoming the direct input of another, and that the whole structure be built on the detailed data used for controlling operations.

However, by doing so, they are suggesting an approach to systems design that is at best uneconomic and at worst based on a serious misconception. While further examining the implications of the framework to system design differences Gorry and Scott Morton (1971)\textsuperscript{26} mentioned that because the information requirements ‘differ sharply’ among the three areas of managerial activity there are ‘few occasions in which it makes sense to connect systems directly across boundaries’.

Therefore, as an implication of the classification (structured, semi-structured, unstructured) of the framework, Gorry and Scott Morton (1971)\textsuperscript{27} state that totally-integrated-management-information-systems ideas so popular in the literature are a poor design concept.

However, the old notion is in fact a new reality for all organisations experiencing ERP systems implementations. An ERP system is built on an enterprise data model and the ERP systems are expensive. Another old notion which is in fact a further new reality is that expressed by Dearden (1972)\textsuperscript{28} who stated the notion that a company can and ought to have an expert (or a group of experts) create for it a single, completely integrated super system - an MIS - to help it govern every aspect of its activity is absurd.

Thus, Wood and Caldas (2001)\textsuperscript{29} have commented that, in practice, the reality of ERP implementation for many organisations implementing this type of software is one in which ‘a golden dream has turned into a nightmare’.

Organisations have adopted a number of different approaches to IS integration; from Data Warehousing in the early-to-mid 1990s, striving to achieve informational integration,

\textsuperscript{26} Gorry and Scott Morton (1971)
\textsuperscript{27} Ibid
through to ERP in the mid-to-late 1990s, focusing on operational integration. Although Data Warehousing and ERP represent two alternate approaches to IS integration in organisations.

Due to the constant regeneration and redefinition of the Data Warehousing concept, there is yet to evolve an ‘inclusive’ definition of Data Warehousing. However, proposed definitions identify the goal of Data Warehousing as enabling the provision of better corporate information to support an organisation.

However, there is also no agreed upon definition for ERP systems, although their characteristics position these systems as integrated, complex mega-packages designed to support the key functional areas of an organisation.

Enterprise Resource Planning (ERP) solutions became the replacement for the conventional legacy systems for many Fortune 500 companies during the 1990s. The main ERP providers were SAP, Oracle Applications, PeopleSoft, J D Edwards and Baan etc.

Multinationals who were looking toward reengineering of processes and cost cutting installed their ERP project initially at their manufacturing sites, centers of distribution etc. As the decade 1990 progressed the growth of ERP software became evident. By the end of the decade ERP was seen as a solution to centralized key processes management of the organizations.

It was this requirement for both JDE clients in the USA and Europe as well as their European competitor SAP, whose typical clients were much smaller than the American fortune 500 firms. McVaney and his company developed a software system that is today known as Enterprise Resource Planning, or ERP, software in response to that business requirement. When we try to understand the growth of ERP, it is appropriate to look back at ERP major milestones as given below:

**The Period of 1990 - 1995**

During the period 1990 to 1995, company management even for companies showing strong growth and profitability, organizations were focused on cost reduction, which was translated into reduction in the number of jobs (Hammer, Champy, 1993)\(^{30}\).

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To reduce costs, the solution was to be rationalized with the processes along with a centralized management of Logistics and Production activities. Gradually, the multinational companies started putting up the investment priority on European factories and distribution centers rather than on country by country units.

These trends were reinforced by the notion of “outsourcing” and progressively the idea was to displace production to those countries where competence existed but where salary and welfare charges were a fraction of those of developed countries.

In this context, the offer of the ERP software, which promised a strategic I.T. solution “one-stop-shop” was perfectly timed. In the marketing and sales pitch, it was understood that a reduction in I.T. personnel would ensue, especially those involved in in-house development; and on the other hand a single data input would mean a reduction in administrative tasks and therefore jobs related to these tasks.

This in turn ensured the payback on the software investment and its implementation. It is of note that these costs accumulated and to an extent remained hidden and unseen over a number of years. Also worth noting is that management now are satisfied with their ERP solution, even though no Return on Investment was calculated and not even the Total Cost of Ownership was estimated.

Another ERP argument in support of ERP sale was the fact that it forced the application of standards and of uniformity in management practices. Now, a multinational’s headquarters could have complete visibility, such as stocks, irrespective of where assets were to be found physically.

One can understand why ERP became so successful for multinational companies managements, and the I.T. management standard for the 1990’s. In near future it is likely that historians will attribute importance to ERP in the evolution of management practices.

**The period 1995-1997**

Those companies who implemented ERP in the years 1990 to 1995 noticed aspects that were missing in terms of a really integrated solution to their business management needs. For example, Marketing and Sales modules were not catered sufficiently by ERP. In
the period 1995 - 1997, ERP software solution providers improved their functionalities that were missing in earlier software. Supplementary modules were offered as an add-on, for example for use by the sales force in the field, or to accommodate EDI which allowed companies to communicate with their wholesalers, their larger customers, their suppliers. As customization to ERP was heavy and costly, the solutions proposed were often products of ERP editor strategic partners.

Software providers regularly organized conferences to explain their products, new versions of their product and collected feedback of user experiences. They also tried to offer add-on modules to their clients so as to provide more efficiency. These conferences proved to be useful and hundreds, if not thousands of persons attended and Editors competed to choose the most prestigious of conference venues.

User companies realized that their ERP system choice is a life long marriage with their Supplier and Editor, and that a divorce was not an option from an economic viewpoint. Editors profited from this situation by imposing practices, updating software version, and changes of their software each 12 to 18 months, with several updates between versions became a normal practice. Often the user companies assisted by the Editor formed groups by region or by vertical sector of activity.

The purchase motivations of prospect customers, and the requirements of their existing customer base, had rapidly changed and provided an adapted solution. The importance was now an integrated solution for all functional areas such as finance/logistics/production etc., and in addition modules also adapted to vertical industrial and commercial sector needs.

The period 1998 - 2000

The year 1998-99 was characterized by Year 2000 projects, allowing companies’ automated systems to pass to the year 2000 (Ross, 1999)31. Editors also had to offer the appropriate version of their software, to be able to accommodate the Euro currency. But

efforts were needed to implement these new versions and investment was concentrated on this priority. For the first time ERP editors found their sales line plat forming out and their profit line showing a downward curve.

Those companies who did not have an ERP solution, worked to implement, those who had a solution hurried to be on the right version, reason was the same, does existing solution will through Year 2000 problem?

The Period 2001 - onwards

There is no doubt that the introduction of this new Information System into an organisation delivered multiple benefits and achieved the desired Return On Investment (ROI). In that way it meets a business need and solves a business problem. Therefore, an organisation’s ability to identify the need of an Information System is extremely critical to ensure success and realised benefits.

New modules add on need specific modules like Customer Relationship Management (CRM), Supply Chain Management (SCM), Web based ERP etc started gaining popularity. As ERP systems are being introduced, the specific needs of the organisations and the specific features that make them different may be lost or eroded in a way that is not controlled or understood by managers.

In certain cases the enormity of the system leads the business rather than the business leading the system. Brown and Vessey (2003)\(^\text{32}\) comment on improving the understanding on how to leverage, what they call, the ‘enterprise system maturity curve’ in an effort to reduce the high risks and costs of implementing ‘the next wave of complex enterprise systems’.

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Table 1-1: Major Milestones of ERP System Evolution

<table>
<thead>
<tr>
<th>Years</th>
<th>Major Concepts Developed</th>
<th>Particulars</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970s</td>
<td>MRP-II</td>
<td>Sales and Operations Planning, Simulation, Forecasting</td>
</tr>
<tr>
<td>2000 -</td>
<td>CRM</td>
<td>Customer Relationship Management</td>
</tr>
</tbody>
</table>

Source: Adapted from Watson and Schneider (1999)\textsuperscript{33}, and Danial Amor (2000)\textsuperscript{34}

1.6 Market Scenario of ERP Software

Over the past 15 years, businesses have changed enormously. The clients are putting lot of pressure for faster service, wider choices, and even lower prices. The globalization of the economy has accelerated and, as a result, many organizations have been redrawn. A number of Information Systems have been developed in order to reply to the challenges of the modern economy. When ERP systems first emerged in the early1990s, manufacturers in a wide variety of industries enthusiastically adopted them.

ERP implementation, without professional help, can be a very expensive project for bigger companies, especially trans-nationals. Companies specializing in ERP implementation, however, can expedite this process and can complete the task in within six months with complete pilot testing. To implement ERP systems, companies often seek the help of an ERP vendor or of third-party consulting companies. Consulting in ERP involves two levels, namely business consulting and technical consulting. A business consultant studies an organization's current business processes and matches them to the corresponding processes in the ERP system, thus 'configuring' the ERP system to the organisation's needs.

Technical consulting often involves programming. Most ERP vendors allow modification of their software to suit the business needs of their customer.

Customizing an ERP package can be very expensive and complicated, because many ERP packages are not designed to support customization, so most businesses implement the best practices embedded in the acquired ERP system. Some ERP packages are very generic in their reports and inquiries, such that customization is expected in every implementation. It is important to understand that for these packages, it makes more sense to buy third party reporting packages that interface well to particular ERP, than to reinvent what tens of thousands of other clients of that same ERP software have needed to develop.

According to AMR Research (Scott and Shepherd, 2002)\(^{35}\), the ERP market is the largest segment of the applications budget (34%). The 74% of manufacturers and 59% of services companies are either using or implementing the ERP software.

Based on revenue earned by Enterprise Resource Planning software market in 2006, top providers of ERP software include Oracle, SAP, BAAN, J.D. Edwards, PeopleSoft, etc. Business information systems can be either designed as custom applications or purchased as off-the-shelf standard solutions. The development of custom applications is generally expensive and is often plagued by uncertainties, such as the selection of appropriate development tools, the duration of the development cycle, or the difficulties involved in assessing costs.

Therefore, companies are radically changing their information technology strategies by purchasing off-the-shelf software packages instead of developing IT systems in-house (Holland and Light, 1999)\(^{36}\). Out of more than 100 ERP providers worldwide, SAP-AG, Oracle, JD Edwards, PeopleSoft and Baan five major ERP software vendors who used to


control approximately 70 per cent of the ERP market share (Mabert et al., 2001)\textsuperscript{37}. The middle end products include SSA, BPCS, Inertia Movers, etc., that 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.

A study on Enterprise Resource Planning software implementations by Panaroma Consulting Group in 2008 across the globe of leading ERP vendors categories vendors as Tier I vendors that include SAP, Oracle and Microsoft, their study includes Tier II solutions providers such as Baan, Epicor, Exact, IFS, Infor, Lawson, Netsuite, Sage, Syspro and others.

According to Gartner, the leading ERP brand in terms of market share is SAP, followed by Oracle and Microsoft. The sample size of study indicates a similar distribution. There were 670 participants in this portion of their study and included data from organizations in the US, Europe, Australia and India. Over 70% of respondents in survey revealed that their companies adopted Tier I ERP software vendors, SAP, Oracle and Microsoft, while 23% of respondents chose Tier II vendors.

![Figure 1-3: Implementation of ERP according to Vendor Category](image)

According to the survey based on 1,600 organizations that have selected or implemented Enterprise Resource Planning within the last four years. This report analyzes project benefits and drawbacks and summarizes implementation approach and satisfaction


30
indicators segmented by major vendors of, figure __ indicates market share of major vendors in 2009.

**Figure 1-4: Market Share of Major Vendors (2009)**

![Market Share Chart]

The main point to be noted is that Tier II vendors have increased their market share from 23% in 2008 to 30% at the time of the survey. The 2010 Enterprise Resource Planning Vendor Analysis Report provides findings on detailed project factors such as implementation costs, durations, and payback periods summarized by vendor. Metrics on selection satisfaction and benefits realization based on vendor interaction are also given to illustrate the market results by vendor.

The survey responses showed that almost half of companies (49.8%) are “fairly satisfied” with their selected Enterprise Resource Planning software vendor. The second highest response was “very satisfied” (18.9%) while just 3.5% are “satisfied.” Therefore, 72% of companies are at least fairly satisfied with their selections.

*Source: Adapted from ERP Vendor Analysis, 2010 ERP Report, Panorama Consulting Group*
1.4 Guidelines for Selecting ERP Vendor

Consultants lead clients through a complete evaluation to ensure that ERP software vendors are aligned with the company’s individual business requirements. The following tips are based on research review and user companies’ reviews and published reports:

i. Understand the total cost of ownership. Very little of a typical ERP project's total budget is spent on ERP software licenses. In fact, our research shows that the average percentage of cost is approximately 25%. The remaining 75% of the budget is typically devoted to implementation services, hardware upgrades, software maintenance, customization, backfilling internal project team resources, and so forth.

ii. Understand the real implementation demands. Implementations rarely take as little time as software sales representatives will claim. Although efforts must be made to control extended timeframes, it’s just a fact that successful ERP implementations take considerable time. A detailed implementation plan should be developed prior to the final decision, and this plan should include details on business process design, configuration, testing, conference room piloting, end-user training, data migration, and more.

iii. Conduct an organizational readiness assessment. No ERP project succeeds without addressing the end-users of the software. Conducting an organizational readiness assessment prior to making the final ERP decision will help identify pockets of
resistance within the company and determine the organizational change management needed to make the project successful.

iv. **Negotiate with your selected Enterprise Resource Planning software vendor.** Some companies spend a great deal of time and money analyzing and selecting a system and then forget to negotiate a fair deal with the vendor. There are several effective ways to negotiate a fair cost and contract terms that help optimize overall cost of ownership.

Figure 1-6 describes the process of vendor selection as given below:

![Vendor Selection Process](image)


1.5 Major Enterprise Resource Planning software vendors and their Indian Clients

Major vendors who are operating in India are as given below:

**Table 1-2: Major Clients of the Main ERP Vendors in India**

<table>
<thead>
<tr>
<th>Vendor</th>
<th>Major Clients</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAP</td>
<td>BPCL, IOC, ONGC, Reliance, Nestle, Colgate-Palmolive, Procterand Gamble, L and T, Mahindra and Mahindra, Tata Motors, Tata Steels, Marico</td>
</tr>
<tr>
<td>Oracle</td>
<td>KPMG, TCS, HP, Compaq, GE, Sony India</td>
</tr>
<tr>
<td>BaaN</td>
<td>Godrej and Boyce, Kirloskar Copeland, Tata Info Tech, Larson and Toubro,</td>
</tr>
</tbody>
</table>
Because of the correlation between size of company and total costs, the comparison includes the average number of users by software vendor. Although both SAP and Oracle were represented by a significant number of smaller companies, the predominance of larger companies drives the average number of users much higher than QAD. However, even though we saw the general cost per user drops with installations in larger companies. Oracle and SAP customers has to pay more than companies with smaller numbers of users. While Lawson’s software only price per user was lowest, they ranked number 2 in total software and services rice per user.

Number of vendors are coming up in the market, however, the profile of major vendors are as given below:

<table>
<thead>
<tr>
<th>Vendor</th>
<th>Customers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peoplesoft</td>
<td>Allianz Insurance, Citibank, Ford, VISA, Merrill Lynch</td>
</tr>
<tr>
<td>JD Edwards</td>
<td>Philips, Lexmark, SmithKline Becham</td>
</tr>
<tr>
<td>QAD</td>
<td>HLL, Godrej Soaps, Nicholas Piramal, Jhonson, Lucent Technologies</td>
</tr>
<tr>
<td>Ramco</td>
<td>Jindal Iron and Steel, Indian Air Force – Nasik, Madras Cements, Madura Fabrics</td>
</tr>
</tbody>
</table>

SAP\(^{38}\)

SAP\(^{39}\) was founded in 1972. Today, SAP is one of the leading international providers of business software. SAP is the world's third-largest independent software manufacturer. SAP has more than 97,000 customers in over 120 countries and employ 47,598 people at locations in more than 50 countries in the European, Middle East, and Africa (EMEA); Americas; and Asia Pacific Japan (APJ) regions.

SAP is headquartered in Walldorf, Germany with annual revue of €9.4 billion in year 2006. The SAP R/3 enterprise application suite for open client/server systems has established a new standards for providing business information management solutions. The


\(^{39}\) SAP is Systeme, Andwendungen, Produkte in der Datenverarbeitung which, translated into English, means Systems, Applications, Products in data processing.
main advantage of using SAP as ERP system is that SAP has a very high level of integration among its individual applications that guarantee consistency of data throughout the system.

SAP’s global development approach focuses on distributing development across the world in strategically important markets. A global network of SAP is spanning across Bulgaria, Canada, China, Germany, Hungary, India, Israel, and the United States, enables SAP to operate globally. As the global technology research unit of SAP, SAP research significantly contributes to SAP's product portfolio and extends SAP's leading position by identifying and shaping emerging IT trends through applied research and corporate venturing. SAP Research has highly skilled teams in 11 research centers worldwide. SAP is also listed on several exchanges, including the Frankfurt stock exchange and NYSE, under the symbol "SAP."

Table 1-3: Business and Corporate Overview of SAP (FY 2010)\(^{40}\)

<table>
<thead>
<tr>
<th>Total Revenue</th>
<th>793088.06(^{41}) million INR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Software and Software-Related Service Revenue</td>
<td>623195.16 million INR</td>
</tr>
<tr>
<td>Operating Profit</td>
<td>164866.11 million INR</td>
</tr>
<tr>
<td>Employees at Year-End</td>
<td>3513 full-time equivalents</td>
</tr>
<tr>
<td>Customers</td>
<td>More than 1,04,000 in over 120 countries</td>
</tr>
<tr>
<td>R and D Investment</td>
<td>119916.79 million INR</td>
</tr>
</tbody>
</table>

Source: Adapted from SAP annual report 2010

SAP serves customers in over 120 countries with three principal geographic regions: EMEA (representing Europe, Middle East, and Africa); America; and Asia Pacific Japan (representing Japan, Australia, and parts of Asia). In 2009, the EMEA region accounted for 53% of total revenues, Americas for 34%, and Asia Pacific Japan for 13%.

Every industry operates according to distinct processes and practices. SAP has identified six industry sectors to focus product development efforts on the key industries that represent to existing and potential customers and to provide best business practices and

\(^{40}\) Official website of SAP, accessed in Jan 2010
\(^{41}\) Conversion from Euro to INR has been done as 1 Euro= 63.6303 INR as on April 17, 2011.
specific integrated business solutions to those industries. In 2009, the six industry groups generated the following revenues:

Table 1-4: Industry wise Revenue of SAP (2010)\textsuperscript{42}

<table>
<thead>
<tr>
<th>User Industry</th>
<th>INR million\textsuperscript{43}</th>
<th>Percentage of total revenues (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process industries</td>
<td>1609719.33</td>
<td>19</td>
</tr>
<tr>
<td>Discrete industries</td>
<td>153985.33</td>
<td>20</td>
</tr>
<tr>
<td>Consumer industries</td>
<td>150612.92</td>
<td>18</td>
</tr>
<tr>
<td>Service industries</td>
<td>177401.28</td>
<td>24</td>
</tr>
<tr>
<td>Financial services</td>
<td>67320.86</td>
<td>8</td>
</tr>
<tr>
<td>Public services</td>
<td>8284.65</td>
<td>11</td>
</tr>
</tbody>
</table>

Source: Adapted from SAP annual report 2010

More than two-thirds of SAP customers are classified as small businesses and midsize enterprises (SMEs). SAP provides a broad range of business solutions for SMEs, which we define as companies with fewer than 2,500 employees or translated revenue U.S. $1 billion or less.

**Solutions and Services Portfolio**

The SAP product portfolio features the following key software applications, which are delivered through multiple deployment and consumption options:

- SAP Business Suite software for large organizations and international corporations supports core business operations ranging from supplier relationships to production to warehouse management, sales, and all administrative functions, through to customer relationships. There are specific solutions for industries, for instance, high tech, oil and gas, utilities, chemicals, healthcare, retail, consumer products, and the public sector.

\textsuperscript{42} SAP Annual Report 2010
\textsuperscript{43} ibid
- SAP Business All-in-One solutions, the SAP Business ByDesign solution, and the SAP Business One application address the needs of small businesses and midsize companies.

- The SAP Business objects portfolio covers a variety of demands from small to large companies with solutions for business users who need to analyze and report information, make informed strategic and tactical decisions, build business plans, and manage risk and compliance.

- SAP solutions for sustainability helps enable organizations' sustainability initiatives. These solutions include the measurement of sustainability key performance indicators, energy and carbon management, and solutions for product safety, environment, health, and safety.

- The SAP NetWeaver technology platform integrates information and business processes across diverse technologies and organizational structures.

- The **SAP R/3 System** is designed to handle all of the business management tasks of a company. Some particular examples that can be seen are like the payment of invoices, management of production resources and the control of financial accounts etc. SAP R/3 handles these tasks using application modules, usually known as modules. R/3 works with a common database. This means that information, which is entered into the system by one part of the organisation, is immediately accessible to all other parts of the organization and hence making everyone always up to date.

- SAP R/2 was designed primarily for the mainframe environment. R/3 is used mainly in the open system or client/server environments. Both R/2 and R/3 use the ABAP/4 programming language, therefore, This means that data can be moved easily between mainframe and open systems. (SAP and Wikipedia)\(^44\)

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ORACLE

More than three decades ago Larry Ellison saw an opportunity that other companies missed and that was a description of a working prototype for a relational database. No company had committed to commercializing the technology, but Ellison and co-founders Bob Miner and Ed Oates realized the tremendous business potential of the relational database model, but they may not have realized that the company they formed would change the face of business computing forever.

Throughout its history, Oracle has proved that it can build for the future on the foundation of its innovations and, its intimate knowledge of customer challenges and successes analyzed by the best technical and business minds in the world. The company has leveraged its immense size and strength to serve its customers, and to implement key technology and business decisions that upend conventional wisdom and take its products and services in new directions.

Today, Oracle is the gold standard for database technology and applications in enterprises throughout the world. The company is the world's leading supplier of information management software and the world's second largest independent software company. The acquisition of Sun gives Oracle a leadership role in the hardware arena as well.

Now the software solution software of Oracle technology can be found in nearly every industry, and in the data centers of 100 of the Fortune Global 100 companies. Oracle is the first software company to develop and deploy 100 percent internet-enabled enterprise software across its entire product line i.e database, business applications, application development, and decision support tools.

Innovation served as the engine of Oracle's success. Oracle was one of the first companies to make its business applications available through the internet with an idea that is now pervasive. Oracle has introduced new Oracle Fusion Middleware products and functionality that reflect the company's goal to connect all levels of enterprise technology, ensuring customers access to the knowledge they need to respond to market conditions with speed and agility.

Before the acquisition of Sun with Oracle, Oracle and Sun introduced the Sun Oracle Database Machine, the world's fastest machine for any type of database workload. Today,
Sun servers and storage, Oracle Real Application Clusters, Oracle Applications, Oracle Grid Computing, support for enterprise Linux, and Oracle Fusion, all are a result of commitment to innovation.

Today, Oracle provides the world’s most complete, open, and integrated business software and hardware systems with more than 370,000 customers including 100 of the Fortune 100 representing a variety of sizes and industries in more than 145 countries around the globe. Oracle's product strategy provides flexibility and choice to our customers across their IT infrastructure. Now, with Sun server, storage, operating-system, and virtualization technology, Oracle is the only vendor able to offer a complete technology stack in which every layer is integrated to work together as a single system. In addition, Oracle's open architecture and multiple operating-system options gives our customers unmatched benefits from industry-leading products, including excellent system availability, scalability, energy efficiency, powerful performance, and low total cost of ownership.

BAAN INFO SYSTEMS, INDIA

Baan Info Systems India Pvt. Ltd is a wholly-owned subsidiary of SSA Global™. This is a Mumbai based company, rated as the Best Enterprise Application provider in India by Dataquest-IDC. India's Customer Satisfaction Audit survey also provides custom made software on Enterprise Resource Planning (ERP). The company has a customer base of more than 150; the company is one of the leading enterprise solution providers in the Indian sub-continent.

iBaan Enterprise Resource planning or (ERP) is one of the major application offered by the company. This application is made to meet specific needs of companies in the Defence, Automotive, Electronic, and Aerospace sectors. Other Baan Info Systems India P Ltd solutions are as mentioned below:

- iBaan OpenWorldX
- iBaan Business Intelligence
- iBaan for Product Life Cycle Management
- iBaan for Customer Relationship Management
iBaan for Supply Chain Management
iBaan Enterprise

Baan provides a host of products and services under the iBAAN banner comprising of iBaan Supply Chain Management (SCM), iBaan Product Life Cycle Management (PLM), iBaan Customer Relationship Management CRM solutions, iBaan Business Intelligence Suite, E-Commerce solutions, iBaan ERP etc.

Baan Info Systems India Pvt. Ltd. has global support centers located in United States, Holland and India. All these centers are strategically located to provide continuing support to the customers that are operating in different time zones of the world. The support centers continuously work towards improvement and expansion of the available services and facilities to cater to their ever increasing customer base. The support to Indian customers is offered from the SSA Global-Baan International Support center at SEEPZ Mumbai and Hyderabad.

Baan Development Centers are spread over an area of 20 acres, SSA Global-Baan Development Center at Hyderabad has more than 400 people working towards enhancing the available range of solutions and new products. The Development Center at Mumbai has around a hundred people working continuously on advanced projects like iBaan OpenWorld and others.

Some of the major customers using Baan Info Systems India P Ltd solutions are: Tata, Gujarat Heavy Chemicals, Merino Panel, Advantec Coils, Bharat Seats, Munjal Auto, Precision Pipes, TEI Electronics, Larsen and Toubro, Vijai Electricals Sundaram Clayton, Anand Group, Dabur, Fiat Auto Limited, Wilcox Limited, Godrej and Boyce, , Indian Telephone Industries, Jubilant Organosys, Thermax Babcock, Kirloskar Copeland etc.

**JD Edwards**

**J.D. Edwards World Solution Company** (JD Edwards, abbreviated JDE), was a computer software company founded March 1977 in Denver, Colorado by Jack Thompson, C.T.P. "Chuck" Hintze, Dan Gregory, and Ed McVaney. The company made its name
building three generations of Enterprise Resource Planning (ERP) software including *World*
for IBM AS/400 minicomputers (the users using a computer terminal or terminal emulator),
*OneWorld* for CNC architecture (a client–server fat client), and *JD Edwards EnterpriseOne*
(a web-based thin client).

JD Edwards was purchased by PeopleSoft, Inc. in 2003. PeopleSoft, in turn, was
purchased by Oracle Corporation in 2005. Oracle Corp. continues to sell and support the JD
Edwards Enterprise-One and World ERP software line.

Ed McVaney was originally trained as an engineer at the University of Nebraska.
Upon finishing his MBA from Rutgers and taking a job with Western Electric in mid-1964
working applied mathematics schemes theory, McVaney first came into contact with
computers that were used for operations research using mathematical modeling programs.
Self-taught in machine language but discouraged by computer and software limitations,
McVaney took a position with Peat Marwick in New York City in 1964. From NYC he was
transferred to Denver, Colorado in 1968. He continued with Marwick until 1970 when he
took a position with Alexander Grant, which subsequently became Grant Thornton. While at
Grant Thornton, McVaney met John Thompson, who was working on an IBM 1130 in
Billings, Montana making $630 a month.

Thompson was lured to Grant Thornton for $750 a month, bringing him to Denver.
At this time McVaney also met Dan Gregory, a MBA student from University of Denver.
McVaney hired Gregory out of the MBA program at Denver University. McVaney describes
that time as a period in which he was developing his personal concept of integrity from a
"high school level" to a much more mature business-related notion of absolute reliability.

At the same time he started realizing that, in his words, "The culture of a public
accounting firm is the antithesis of developing software. This indicated to McVaney that
accounting clients did not understand what was required for software development.
McVaney came to the conclusion that he had to start his own firm to implement his own
approach to accounting business software development.

In 1977, unsatisfied with conventional approaches to business software development
and accounting software services, McVaney started JD Edwards by selling co-workers, Dan
Gregory and Jack Thompson, on his concept. He envisioned a radically different approach to
accounting software development, one that represented a significant cultural shift from
typical sales promises to total commitment to the customer's goals, based on an integrity-based approach to customer requirements.

After discarding the name Jack Daniels and Co., the group decided that the name JD Edwards sounded better ("J" for Jack, "D" for Dan, and "Edwards" for "Ed"). Initial clients included McCoy Sales in Denver, Colorado, a then $4-million wholesale distribution company and Cincinnati Milacron Company, a maker of machine tools. McVaney and his team received a $75,000 contract to write software to develop a wholesale distribution system. The new company also got a $50,000 contract with the Colorado Highway Department to develop a governmental accounting, construction cost accounting system.

McVaney's first international client was Shell Oil Company in Cameroon, Africa. Co-founder Dan Gregory flew to Shell Oil, himself to install the company's first international, multi-national, multi-currency client software system.

Majority of JD Edwards's customers were medium-sized companies, clients did not have the luxury of gigantic accounting software implementations. There was a basic business need for all accounting to be tightly integrated. As McVaney explained in 2002, integrated systems were created precisely because "you can’t go into a moderate-sized company and just put in a payroll. You have to put in a payroll and job cost, general ledger, inventory, fixed assets and the whole thing. JD Edwards had the same advantage as SAP had because they worked on smaller companies and were forced to see the whole broad picture".

It was this requirement for both JDE clients in the USA and Europe as well as their European competitor SAP, whose typical clients were much smaller than the American fortune 500 firms. McVaney and his company developed a software system that is today known as Enterprise Resource Planning, or ERP, software in response to that business requirement.

*JD Edwards WorldSoftware*, popularly called *World*. Development began with the System/34 and /36, focusing from the mid 1980s on System/38 minicomputers, then switching to the AS/400 when it became available. The company initially focused on developing the accounting software needed by their clients. *World* was server-centric; the users would operate an IBM computer terminal or "green-screen". (Later, users would run terminal emulator software on their personal computers). As an ERP system, JD Edwards
comprises three basic areas of expertise: functional/business analyst, programmer/software developer, and CNC/system administration.

Microsoft Dynamics

Microsoft Dynamics is a line of business management solutions that works like and with familiar Microsoft software, automating and streamlining financial, customer relationship, and supply chain processes in a way that helps you drive business success. To thrive companies need to transform themselves into “dynamic businesses” that can identify new market opportunities and respond quickly to emerging customer needs. This means retiring complex and aging legacy systems in favor of newer applications that enable greater business agility and support simplified business processes.

MS-Dynamics’ business is the vision that Microsoft has for companies that continuously evolve and transform in response to changes in their business environment. These companies take advantage of flexible business systems that empower employees, simplify processes, and connect ecosystems of customers, partners, and suppliers. Microsoft demonstrates its commitment to this vision through the technology investments made in Microsoft Dynamics business management solutions. Microsoft uses the design principles of simplicity, value, innovation, and choice to guide these investments. One area in particular where Microsoft Dynamics has focused is in designing its solutions to work with the Microsoft® Office system and Microsoft SharePoint® Server, the business productivity tools that millions of information workers use every day. This coordinated design delivers many benefits to businesses, including operational flexibility, efficiency, and productivity.

Microsoft Dynamics ERP solutions work with or run on the latest Microsoft products and technologies take advantage of new innovations by combining your Microsoft Dynamics ERP solution with:

(a) Microsoft Office 2010
(b) Microsoft Communicator
(c) Microsoft SharePoint Server 2010
Microsoft Dynamics Business Ready Enhancement Plans offer a broad range of support benefits. These plans can provide unlimited online training, access to self-service support, transition investment credits when you transfer to a different product or edition, and downloads of service packs and new releases. Microsoft Dynamics ERP offers several solutions designed to meet the needs of your unique organization, including:

- **Microsoft Dynamics AX** is designed to help organizations operate across locations and countries by standardizing processes, providing visibility across the business, and helping to simplify compliance.
- **Microsoft Dynamics GP** helps you connect business processes, gain insight with robust reporting and business intelligence tools, meet industry-specific needs, and adapt your solution easily and cost-effectively.
- **Microsoft Dynamics NAV** is fast to implement, easy to configure, and simple to use. Available in more than 40 country versions, the solution can help organizations streamline specialized business processes.
- **Microsoft Dynamics SL** is specialized to help project-driven organizations manage people, projects, and profitability and is particularly suited for professional services, operations, field services, and construction management companies.

PeopleSoft®

PeopleSoft Inc. is a global leader in enterprise application software, serving more than 4,000 customers in the fields of customer relations management, human resources

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45 Official website of peoplesoft  [www.peoplesoft.com](http://www.peoplesoft.com), (accessed in July 2010)
management, financial management, and supply chain management, along with a slew of industry-specific concerns.

The company was incorporated in 1987. Clients of the company include small and medium-sized businesses as well as some of the largest companies in the world. After enjoying explosive growth during its first decade of existence, PeopleSoft's pace of expansion slowed over the last two years of the 20th century, as increased competition and Y2K concerns reduced demand for its products. During that period, however, the company rededicated itself to providing cutting-edge, Internet-based software applications in an effort to recapture market share and reignite growth.

The Origins of PeopleSoft

Dave Duffield and Ken Morris are the progenitors of PeopleSoft. Both software developers had been working at Integral Corp. before jumping ship to start their own company. In fact, Duffield had founded Integral in 1982 and served as its chief executive until 1984. Integral started out providing consulting services but later moved into the lucrative market of mainframe computer software. Duffield was credited with helping to grow Integral into a $40 million (in sales) producer of human resources applications for use on mainframes.

By the mid-1980s, after taking Integral public, Duffield had effectively lost control of the company that he had founded. That loss of authority ultimately would cause Duffield to jump ship. The conflict arose when Duffield took an interest in the burgeoning personal computer networking industry. At the time, mainframes were still the dominant platform for large and mid-sized companies, and Integral had profited handsomely by chasing that big market. But early on Duffield recognized the potential of personal computer networks (dubbed client/server systems because the PCs were linked to a server system). He believed that Integral should shift its focus away from mainframes and toward client/servers, which he viewed as the wave of the future.

Integral's board of directors disagreed with Duffield, so he decided to leave the organization. He even offered to sign a no-compete agreement with Integral in return for one
year's salary, which would have kept him from competing with Integral in the human resources software industry. Integral's board foolishly rejected the offer, and Duffield started a new company that he called PeopleSoft. Duffield took fellow Integral employee Ken Morris with him, and together they began designing human resources software geared for client/server systems. In 1988 Morris and Duffield introduced the first high-end human resources software application ever designed for a client/server system.

Although PeopleSoft's first program was greeted by a willing market, the tiny firm was strapped for cash. To fund the start-up, Duffield took out a mortgage on his home; he and Morris tapped the nest egg to fund the development of their first program. That effort generated revenues of about $200,000 in 1988, the company's first year of sales. Significantly, the company scored a major coup in 1988 when it landed Eastman Kodak as its major customer. That gave a much-needed boost to PeopleSoft's bottom line.

Kodak, like many other corporations in the late 1980s, was beginning to realize the advantage of the client/server approach. A company could purchase a number of relatively inexpensive PCs, network them through a more expensive server, and have a system with capabilities similar to a mainframe. The obvious advantages were much lower costs and, in many cases, increased flexibility. At the same time, PeopleSoft's human resources software became a valuable tool for companies that were reorganizing and cutting costs during the recession of the early 1990s. Thus, as the client/server industry took off and PeopleSoft's innovative human resources program became known, sales shot up. In 1989 PeopleSoft generated an impressive $1.9 million in sales. That figure exploded to $6.1 million in 1990, about $420,000 of which was netted as income.

PeopleSoft Inc. is one of the global leaders in enterprise application software, serving more than 4,000 customers in the fields of customer relations management, human resources management, financial management, and supply chain management, along with a slew of industry-specific concerns. Clients include small- and medium-sized businesses as well as some of the largest companies in the world. After enjoying explosive growth during its first decade of existence, PeopleSoft's pace of expansion slowed over the last two years of the 20th century, as increased competition and Y2K concerns reduced demand for its
products. During that period, however, the company rededicated itself to providing cutting-edge, Internet-based software applications in an effort to recapture market share and reignite growth.

Today, more than 1,000 customers in 144 countries are reaping the real-world benefits of our investment. PeopleSoft 8 makes better interactions possible by delivering both the relationship and analytic data you need to the employee in your organization who needs it, when they need it. Relationship data includes details of past transactions, from the size and status of a vendor's latest shipment to which sport a customer's kids play. Business analytic data indicates which customers are the most important based on the amount of product they are likely to buy and your cost of serving them, or which vendors deliver the highest quality products, on time and at the best price.

The sales force or customer service teams have that data available from any browser when the customer calls or when the vendor is ready to negotiate a price. Optimizing interactions, managing real-time business processes, analyzing your business to anticipate opportunities, increasing revenue, and reducing costs. It all adds up to more profitable relationships. It's what you can expect from PeopleSoft: software and services for the real-time enterprise.

1.7 Rationale for Selecting Indian Multinational Companies

The concept of multinational sales was not a viable option until modern transportation and communication systems were developed. However, in many parts of Europe companies were able to sell goods and services in their neighboring countries. This was only because the size of the countries was small enough. In reality, it was not until the wide use of transport trucks, container ships, cargo planes, and/or railway networks that the movement of products over large distances became feasible. The trend towards the globalisation of production in its broadest sense can be roughly divided into three stages:

The first of these, during which direct foreign investment occurred on a considerable scale, began approximately in the middle of the 19th century and ended with the outbreak of World War I. The second stage, marked initially by a recovery of foreign activities by private enterprises but followed by stagnation and then an absolute decline in these
activities, comprised the inter-war period. The third stage in this development started at the end of World War II and has been marked by an almost steady, large-scale growth of global business dealings, foreign direct investment in other countries, and direct cooperation among countries.

The goal of a company is to increase the wealth of its shareholders and benefit of its employees. A primary method of doing so is by maintaining and increasing its ability to grow. Once a company has operated in a specific region or country for a long period of time, it may start to face problems with meeting its growth targets. One way to continue the growth, is to expand into new and emerging markets.

This results in branching out into the international marketplace. That is, a multinational manufacturing company that does business in a number of countries has substantial commitments of its resources in international business. The enterprise should engages in international production in some potential countries, and has a worldwide perspective in its management. By spreading out into multiple countries, the company continues to grow and reduces the risks it faces if conditions in one country changes drastically and adversely.

A survey of 539 heads of IT from a broad range of industries, including manufacturing, government, health care, technology, education, and finance, by CIO Magazine (Cosgrove, 2003) showed that the most important issue facing Multinational Companies the CIOs was to find best practices for the IT unit to partner with other business units and deliver the greatest value to the organization. The IT unit’s greatest challenge was in prioritizing demands from various business units and aligning IT with business goals.

IT and business alignment tops the list of concerns and priorities for CIOs in 2004, according to a number of recent IT executive studies. As IT budgets start to finally open up again, business executives are counting on their CIOs to make smart investment decisions that positively affect the business bottom line. Business sense for a CIO these days is no longer just gravy — it’s key to their survival (“Business / IT Alignment”, 2004).

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Information Technology (IT) is one of the key factors driving progress in the 21st century; it is transforming the way we live, learn, work, and play. Advances in computing and communications technology have created a new infrastructure for business, scientific research, and social interaction.

Although information systems create many exciting opportunities for businesses, they are also a source of new problems, issues, and challenges for managers. Large software and hardware systems continue to fail despite rapid advances in information technology. For more than a decade, businesses and industries have complained that the skills of information systems (IS) personnel entering the workforce are not sufficient to meet the challenges of a high-performance Workplace.

It is critical for information technology (IT) professionals to understand how IT can be used effectively in Multinational organizations. Some of the major challenges faced by the MNCs are given below:

i. **The Strategic Business Challenge**: Despite their substantial investments in information technology, many organizations are not realizing significant business value from their systems, nor are they becoming digitally enabled. To fully benefit from information technology, realize genuine productivity gains, and take advantage of a company’s full capabilities, many organizations may need to be redesigned, requiring changes in business models and organizational structures.

ii. **The Globalization Challenge**: The rapid growth in international trade, partnerships among countries such as NAFTA, the European Union and ASEAN, and the emergence of a global economy highlights the need for information systems that can support production, marketing, and sales of goods in many different countries. There is an increasing need for transnational business processes and supporting information systems that can produce profit and loss and balance sheets for a multinational corporation on a daily basis, provide effective global logistics operations, and continue to perform effectively when companies within the corporation merge with new companies or are divested.
iii. **The Information Architecture and Infrastructure Challenge:** Many companies are using conventional information technology platforms that cannot adapt to innovation and change. Meeting new business and technology challenges may require redesigning the organization and building new information architectures and corresponding information technology infrastructures. Information architecture is the particular form that information technology takes in an organization to achieve organisational goals or functions.

It is essentially a design that shows how the firm’s key business application systems are integrated together by the software to meet the business needs. The firm’s IT infrastructure provides the technology platform for this architecture. The computer hardware, software, data and storage technology, networks, and human resources required to operate the equipment constitute the IT infrastructure and should be available to all of its applications. However, most companies are crippled by fragmented and incompatible computer hardware, software, telecommunications networks, and information systems that prevent information from flowing freely between different parts of the organization.

**1.7.1 Importance of ERP Implementation in Indian Multinational Organisations:**

Enterprise Resource Planning (ERP) systems have emerged as a solution to address the challenges faced by MNCs as explained above and are used to coordinate activities, decisions, and knowledge across all functional departments, levels, and business units in an enterprise. Just as the Internet has revolutionized the way in which we may gather and transfer information, ERP has the potential to revolutionize the fundamental ways in which information is stored and retrieved in an organization. Such as the World Wide Web has revolutionized how we access the data and Internet Explorer, which has revolutionized the way in which we browse the Internet, the same way ERP systems are designed to
standardize the manner in which transactions in a business are recorded and retrieved. (source: Chetan S S and Karl-Heinz Rau)47

This research will seek to study the fundamentals of ERP systems and how global growth of the organizations and are used all around the world. Effective implementation of these systems can provide enormous benefits to companies and Nation. At the same time, it requires to learn a set of skills to succeed in the IT profession and management and learn about change management principles, and understand how to design IT systems that facilitate effective change in organizations.

Chapter 2

LITERATURE REVIEW

2.1 Background
2.2 Major Studies on the Subject
2.3 Research Gap
2.1 Background

The success of an ERP implementation can be defined in two ways. **First**, an implementation is considered successful if it meets the initial project requirements as given such as **Cost saving**, meeting deadlines, staying within budget and achieving system performance as expected (Robey, Ross and Boudreau, 2000). The **second** and ultimate sign of a successful ERP implementation is the **cost effective integration** of complete business processes being used in the organization.

Companies satisfied with their ERP software often list dozens of productivity enhancements, including process automation, **improved cost efficiency**, tighter integration, as well as elimination of bottlenecks and duplicative procedures (Plotkin, 1999).

2.2 Major Studies on the Subject

“**ERP in the Internet Economy**” (Les Hayman, 2000) presents findings of a survey on manufacturing strategy practices adopted by the Indian machinery manufacturing companies (IMMC). Based on the survey, three companies have been selected for detailed case studies. Their experiences in the manufacturing strategy process are analyzed. Although the companies represented diversity in terms of product type, sales volume, and geographic location, they share several commonalities including use of advanced manufacturing technologies and use of several improvement techniques. The process of strategy formulation varied among the companies in terms of participants, complexity and degree of formalization. Competitive priorities, order winners and critical success factors are also identified for these companies. Based on strategic manufacturing issues, manufacturing competence index and business performance index for the companies has been worked out.

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Kyung-Kwon Hong and Young-Gul Kim (2002) have given their opinion in their work “The critical success factors for ERP implementation an organizational fit perspective” that since early 1990s, many firms around the world have shifted their information technology (IT) strategy from developing information systems in-house to purchasing application software such as enterprise resource planning (ERP) systems. IT managers responsible for managing their organization’s ERP implementation view their ERP systems as their organizations’ most strategic computing platform.

However, despite such strategic importance, ERP projects report an unusually high failure rate, sometimes jeopardizing the core operations of the implementing organization. This study explores the root of such high failure rate from an “organizational fit of ERP” perspective. Based on the relevant literature, we define the concept of organizational fit of ERP and examine its impact on ERP implementation, together with ERP implementation contingencies.

Sally Wright, Arnold M. Wright, (2002), in their publication titled “Information System Assurance for Enterprise Resource Planning Systems: Unique Risk Considerations” discovered that Enterprise Resource Planning (ERP) systems inherently present unique risks due to tightly linked interdependencies of business processes, relational databases, and process reengineering. Knowledge of such risks is important in planning and conducting assurance engagements of the reliability of these complex computer systems. Yet, there is little empirical evidence on this issue.

The results of many researches indicate that the implementation process of ERP systems has an important impact on system reliability. Further, IT professionals identified a number of common implementation problems (e.g., improperly trained personnel and inadequate process reengineering efforts) that result in heightened risks. They also believe that ongoing risks differ across applications and across vendor packages.

Donald Chand, Et. al. (2005)\(^6\), assessed the strategic impacts of ERP systems and found that although there is no analytical framework for assessing the organizational benefits of ERP systems, several researchers have indicated that the balanced scorecard (BSC) approach may be an appropriate technique for evaluating the performance of ERP systems. This paper fills this gap in the literature by providing a balanced-scorecard based framework for valuing the strategic contributions of an ERP system.

Using a successful SAP implementation by a major international aircraft engine manufacturing and service organization as a case study, this paper illustrates that an ERP system does indeed impacts the business objectives of the firm and derives a new innovative ERP framework for valuing the strategic impacts of ERP systems.

Panayiotou Nikolaos Et al. (2005)\(^7\) in their study “An application of multi-criteria analysis for ERP software selection in a Greek industrial company”, analysed the application of multi-criteria analysis in a large Greek company for the selection of an ERP (Enterprise Resource Planning) system. The limited time available in most of the companies for software selection, the inability to make fast but sound decisions on IT issues and the luck of technical expertise in ERP functionality often results in an undocumented or even irrational final decision. As a consequence, the purchase of expensive software ends up to be affected by issues such as personal acquaintances, sporadic information, fashion or intuition.

Taking into account all the existing practical constraints in the Greek industry due to the limited existence of resources, a practical and easy-to-use methodological approach was developed, using the typical principles of multi-criteria analysis for the software selection and implementer selection process. The objective of the approach is to provide an easy way to support the final decision in the selection problem in a documented manner. The practical application of the proposed approach is presented in a real case study of a Greek company, emphasising on the process, organisational and computational dimensions of the selection.


Paper titled “An exploratory study of manufacturing strategy practices of machinery manufacturing companies in India” by G.S. Dangayach and S.G. Deshmukh, (2006)\(^8\) presents findings of a survey on manufacturing strategy practices adopted by the Indian machinery manufacturing companies (IMMC). Based on the survey, three companies have been selected for detailed case studies. Their experiences in the manufacturing strategy process are analyzed. Although the companies represented diversity in terms of product type, sales volume, and geographic location, they share several commonalities including use of advanced manufacturing technologies and use of several improvement techniques.

The process of strategy formulation varied among the companies in terms of participants, complexity and degree of formalization. Competitive priorities, order winners and critical success factors are also identified for these companies. Based on strategic manufacturing issues, manufacturing competence index and business performance index for the companies has been worked out.

Young B. Moon (2007)\(^9\) in their study “Enterprise Resource Planning (ERP): a review of the literature”, presented a review of work published in various journals on the topics of Enterprise Resource Planning (ERP) between January 2000 and May 2006. A total of 313 articles from 79 journals are reviewed. The article intends to serve three goals. First, it will be useful to researchers who are interested in understanding what kinds of questions have been addressed in the area of ERP. Second, the article will be a useful resource for searching for research topics. Third, it will serve as a comprehensive bibliography of the articles published during the period.

Simon Jacobson et. al. (2007)\(^10\) in The ERP Market Sizing Report, 2006–2011 stated that The ERP market had a spectacular year, with total revenue growing by 14% and license revenue up an amazing 18% from 2005. While sales of traditional ERP applications were very healthy in 2006, many vendors also saw substantial revenue


growth from the acquisition of other software companies. Globalization, centralization, and regulatory compliance were the key drivers for continued ERP investment among large corporations. In the small and midsize business (SMB) segment, which continues to outgrow the overall market, companies are buying new ERP systems in response to new customer requirements and the desire to participate in the global market. Here are some major trends from the 2006 ERP market

(a) ERP vendors that traditionally offered a single, internally developed product line now go to market with a broad portfolio of products targeted to specific industry and departmental buyers

(b) Oracle and SAP continue to dominate the market among very large global companies. In the increasingly important SMB segment, though, they face formidable competition from Infor, Sage Group, Microsoft, Lawson, and Epicor.

(c) New pricing and deployment models, such as software as a service (SaaS) and enterprise licensing, are starting to gain acceptance. We expect most of the ERP vendors will begin offering on-demand in addition to onpremises options in the near future.

(d) The fundamental ERP concept of a single-vendor, pre-integrated suite of packaged business applications is making excellent headway in non-manufacturing markets such as retail, financial services, and public sector. As ERP vendors buy and build the necessary industry functionality, their available market rapidly expands.

In paper “Intangible benefits valuation in ERP projects” author Kenneth E Murphy, Steven John Simon (2002)\(^\text{11}\), author has defined that the development, implementation and ownership of information systems, especially large-scale systems such as enterprise resource planning (ERP), has become progressively longer in duration and more cost intensive. As a result, IS managers are being required to justify projects financially based on their return.

Historically, information systems have been difficult to quantify in monetary terms because of the intangible nature of many of the derived benefits, e.g. improved customer service. Using the case study methodology, this paper examines an attempt by a large computer manufacturer to incorporate intangibles into traditional cost–benefit analysis in an ERP project. The paper reviews the importance of intangibles, lists intangible benefits that are important in ERP projects and demonstrates the use of a scheme through which they can be incorporated into traditional evaluation techniques.

Recently Amoako-Gyampah et. al. (2008) in their paper “Manufacturing strategy, competitive strategy and firm performance: An empirical study in a developing economy environment” examined the relationship between manufacturing strategy and competitive strategy and their influence on firm performance. We test how competitive strategy influences manufacturing strategy and also examine the impact that manufacturing strategy and competitive strategy have on firm performance among Ghanaian manufacturing firms.

They found significant and positive relationships between competitive strategy and the manufacturing strategies of cost, delivery, flexibility, and quality. The findings also indicate that quality is the only manufacturing strategy component that influences performance. Their results further show that although competitive strategy does not directly affect firm performance, it does so indirectly through quality. Thus, whether a firm chooses to pursue a cost leadership or a differentiation strategy an emphasis on quality provides the most benefits with regard to firm performance.

An emphasis on quality appears to provide a means by which companies can mitigate the effects of increased competition resulting from the economic reforms within the Ghanaian manufacturing environment.

Yahaya Yusuf, Angappa Gunasekaran, Canglin Wu, (2008) further studied and described in their paper “Erratum to Implementation of enterprise resource planning in China” that Enterprise Resource Planning software implementation combines people, technology, and processes. It embodies a complex implementation process, especially in developing countries like China, often taking several years, huge amount of fund and involving a major business process reengineering exercise.

In this paper he made an attempt to explain some China specific difficulties in the implementation process and provide solutions to implement Enterprise Resource Planning system successfully through various methods. On the basis of analysis of questionnaire results, some common difficulties have been explored by authors, such as support of top management, costly and time-consuming, cultural differences, technical complexity, lack of professional personnel, and inner resistance.

The implementation difficulties are largely due to the nature of enterprise's ownership and size. Suggested solutions to overcome these difficulties such as ERP software packages selection, Enterprise Resource Planning implementation team, Business Process Re-engineering, Training, and Outsourcing-Application Service Provider will serve foundation and will give a near idea about these issues in Indian context.

Veena Bansal and Tripti Negi, (2008) also in their paper “A Metric for ERP Complexity”, mentions that Enterprise Resource Planning (ERP) is a complex software. We use information flow metrics to quantify complexity of Enterprise Resource Planning software. The information flow metrics is defined in terms of flow of information within and among module/function/process. They computed complexity of sales and order process of a popular Enterprise Resource Planning software package (SAP) using information flow metrics.

Their study concludes that the complexity of the ERP package is due to the underlying business process. We then quantitatively show that configuration process of

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an Enterprise Resource Planning system is also complex. The complexity figures can be used to make the management commit appropriate resources to an ERP project. If an organization has used transaction processing systems, followed by management information systems and decision support systems in a networked environment, the organization may implement ERP using big bang approach. Otherwise, a phased approach is much safer and it will give organization time to mature.

Vikas Jain, (2009)\textsuperscript{15} in his paper titled “Assessing Value of ERP Systems: A Formative Construct Analysis” published in proceedings of Americas Conference on Information Systems (AMCIS-2009) also found that ERP systems have the potential to provide value across multiple dimensions: from operational and managerial to strategic. As with any other information technology, the value of ERP systems can be assessed using different metrics. The available methods of ERP value assessment such as financial performance indicators for the organization do not provide multidimensional contribution of ERP systems.

Very few studies in ERP value literature have quantitatively measured and validated ERP value across multiple dimensions. Using the Balanced Scorecard (BSC) approach, this study conceptualizes and validates measures of ERP value across four dimensions of BSC: internal business oriented ERP value, customer oriented ERP value, learning and growth-oriented ERP value, strategic and financial-oriented ERP value. The measurement model for ERP value indicates the robustness of measures used in the study.

Lluís Santamaría-Sánchez et al. (2010)\textsuperscript{16} also in their study on “The role played by interdependences in ERP implementations: An empirical analysis of critical factors that minimize elapsed time” analyzed the role played by different module types that influence the time spent on an ERP implementation. By using the concept of interdependences together with organizational integration theory, we


distinguished between business-support and value-chain modules and affirmed that their respective implementation times would differ.

They also highlighted the existence of time-savings and facilitator mechanisms that could reduce the total elapsed time for an ERP implementation with these module types. We found empirical support for our hypotheses by using data from 141 organizations and using econometric duration models. Through contextual, organizational, and project specific controls, our results lead us to the conclusion that value-chain modules take longer than business-support modules to implement. Furthermore, they found empirical evidence of time-savings and facilitator mechanisms in the ERP implementation process.

2.3 Research Gap

Though much literature has been published on ERP Implementation and its various dimensions, yet, most of the studies do not focus on to the Indian multinational organisations and peculiar Indian IT environment in which they operate. Indian MNCs are having great potential in global market and are growing almost in all important sectors of the business

ERP software if implemented successfully may yield in much faster growth and better control on their business operations. Thus, there is a requirement to explore the importance and effects of ERP Implementation on Indian MNCs including the aspects such as various costs, benefits, and Critical Success Factors in detail, specially in multinational companies as they have a large network of their operations and branch offices in other countries also that need to be controlled. The Enterprise wide software can be proved very effective in managing the operations centrally.
Chapter 3
OBJECTIVES AND RESEARCH METHODOLOGY

3.1 Objectives
3.2 Hypotheses
3.3 Scope of study
3.4 Research Methods
3.5 Research Approach
3.6 Data Collection Methods
3.7 Limitations of the Study
3.8 Evaluation Methods Used
This chapter contains the objectives and description of the research method used in this research. First of all objectives of study are given as below:

3.1 Objectives of Study: The study has the following objectives:

1. To evaluate major cost/benefit aspects of ERP implementation in selected Indian multinational organisations;
2. To examine the impact of ERP implementation in selected multinational organizations; and
3. To identify ‘Critical Success Factors’ of Implementation of ERP software.

3.2 Hypotheses

H01: Implementation of ERP software in an Indian multinational organisation is economically feasible.

H02: ERP Software implementation significantly reduces the cost of major operations.

3.3 Scope of Study

Enterprise Resource Planning (ERP) is more than simply a software package. Implementing ERP will involve the entire business and will require changes throughout the firm. Because of the scope, complexity and continuous nature of ERP, the project-based approach to managing the implementation process resulted in failure rates of between 60% and 80% (Mehmet C et. al. 2006)\(^1\). First of all, the ERP system seeks to integrate all functional areas of an organisation, and therefore may considered as the information backbone of the company. Secondly, As the ERP-system implementation impacts on several levels of the company, it is difficult to find investment / benefits evaluation model that successfully evaluates the multi dimension ERP-system. Thirdly, an ERP implementation is not just an IT solution, but it also has direct impact on the organisation’s structure, its culture and strategy and finally, the ERP-system implementation cost structure is different from most of the conventional costs.

Although there are some identifiable direct costs such as related to licenses, hardware and software costs, but the main cost element is implementation cost. The implementation process is also quite lengthy, and although the most ERP-system vendors claim that its implementation takes approximately six months, this only includes the installation of the system, rather than any delivery of business benefits, which might take years to materialize (Banks, et al., 1999). Therefore, the scope of research shall include:

i. Coverage of Industry: This research study will include selected Indian multinational corporations, who have implemented ERP software in their organization effectively in generating lower cost of production and operations and thereby gaining competitive edge.

ii. Geographical Coverage: The research will include Indian multinational corporations operating in India and abroad.

iii. Major Aspects covered: The research will evaluate various operational costs, Operating Margins, and Payback period. It will also identify various direct and indirect costs and benefits.

3.4 Research Methods

The main goal of research is to develop knowledge. Research methodology refers to the procedural framework within which the research is conducted. It describes an approach to a problem that can be put into practice in a research process, which could be formally defined as an operational framework within which the facts are placed so that their meaning may be seen more clearly (Bryman and Bell, 2007).

In other words, “Methodological insight gives a better understanding of previously conducted research and how to proceed in future.” (Gammelgaard, 2004) and used as the tool by the researcher during the process of developing new knowledge. This chapter will include a brief discussion of methodological issues,

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3 Alan Bryman and Emma Bell (2007), Business Research Methods, Oxford University Press, pp.7-10.
research approach, choice of data collection method, sample selection and a research evaluation discussion.

Research methods can be classified in different ways, the most common distinction is between the quantitative and the qualitative approaches (Myers, 2007). Quantitative approaches were originally used while studying natural sciences like: laboratory experiments, survey methods and numerical methods. A qualitative study is used when the researcher wants to get a deeper understanding on a specific topic or situation.

Myers (2007) stated that the qualitative approach was developed in social sciences in order to support the researcher in studies including cultural and social phenomena. Sources included in the qualitative approach are interviews, questionnaires, observations, documents and the researcher’s impression and reactions. The chosen approach is qualitative and the motivation of the chosen approach will be discussed below:

**Choice of Research Methods**

The research in study has been done using cases, reports, scenario analysis and the interviews of the key officials of User and vendor organisations. The data has been collected both quantitative and qualitative so as to present facts in a reasonable way. It was vital to have a clear picture on how the situation in the cases was after ERP implementation and what was prior to implementation.

The results of the interviews executed were influenced by different level since the head of the department, the project coordinator, and the affected buyers and additional other knowledgeable persons were involved. Another research method to use could be an action research, which also lies under the qualitative research method. The objective of the action research is to contribute both to the practical concerns of people in an immediate problematic situation and to the goals of social science by joint collaboration within a mutually acceptable ethical framework” (Myers, 2007), this can be taken into consideration while executing a study similar to this one.

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6 Ibid Myers (2007)
7 Ibid Myers (2007)
Case Study Analysis

Cases are descriptions of situations that frequently focus on a problem in pursuit of their occupation or interests. They usually involve the consideration of an actual example, requiring the synthesis of a large amount of different kinds of information, and the making of recommendations or decisions (Krone J et al., 2002)\(^8\). The case study takes shape as the empirical details that constitute the decision or problem under study are considered in the light of the evidence gathered from the workplace (Naumes and Naumes, 1999).

This gives depth and dimension to the scenario presented in the case study (Hamel, Dufour, and Fortin, 1993, Ellram (1996)\(^9\) stated that executing a case study methodology results in a rigorous analysis. A case study requires a careful planning and execution. A case study also requires the ability to step back from data, analyze it objectively, develop explanations creatively and search for different patterns in order to find different issues or problems in the existing patterns.

Ellram (1996)\(^10\) claimed that case studies are excellent to theory buildings, providing detailed explanations of best practices and providing a better understanding of the data that has been gathered. After several theory researches the empirical findings within Multinational Companies operating in India shall be discussed and analyzed on the basis of the theoretical framework. By executing a case study a comparison between theories and found facts can give both expected and unexpected results.

3.5 Research Approach

The study will use all the three types of research approaches, namely

1. Descriptive
2. Explorative


3. Analytical : Case Analysis

In this thesis, most of the research to be conducted in the first part will be based on a **descriptive approach** since we aim to establish outline existing models used for evaluating ERP-system investments. Additionally, report is also going to document and describe what companies consider costs and benefits with ERP systems, and this is based on the findings of the empirical study. This thesis will also include some **explorative** elements, mainly during its early stages, when examined the secondary sources available in order to develop understanding of the research area. During this phase we will also be able to more clearly define purpose as well as the limitations adopted for the descriptive part of the research. The second part of this thesis will be **prescriptive** in nature, since this part focuses on constructing a method for identifying and measuring the cost and benefit characteristics of ERP-system investments.

### 3.6 Data Collection Methods

While deciding on data collection method for a study there are a number of factors that have been considered. Since all methods have their strengths and weaknesses, it is important to evaluate each method’s appropriateness in regard to the study being carried out.

Because a study is usually made up of different types of data, a number of methods might be used in order to be able to address the research problem as fully as possible. It is common to make a distinction between two different types of data, namely **primary and secondary** data.

**Primary data** is information collected and used for the first time, and usually through direct examination, whereas **secondary data** consists of information already available, i.e. it has been collected or produced by a third party and perhaps for a different purpose. Because of the inherent difference between these two types of data, different collection methods have to be adopted when collecting it. This thesis will use both primary and secondary data to address and analyze the research problem, and hence a number of collection methods will be used.
3.6.1 Primary Data Collection

Data that has been collected for the first time by the researcher are defined as primary data. Primary data consists of interviews, observations, questionnaires and experiments (Arbnor and Bjerke, 1999)\textsuperscript{11}. Throughout this study have observations and interviews been used to gather data.

**Interviews**

Interview is the method of obtaining qualitative data (Malhotra and Dash, 2010)\textsuperscript{12}. This is a method collecting data through questioning by personal contacts or via telephones, email and text messages. There are a number of different ways to execute an interview. By using a structured interview all questions are decided in advance. A semi-structure interview has a decided subject but the some questions may also be formulated during the interview.

Unstructured interview is one in which the interview become more as a conversation between the interviewees and the interviewer. The interviews can be executed toward one person or a group. Interviews with employees (the head, project coordination, buyers and other knowledgeable persons) have been very helpful since it is very important to receive correct information. The interviews consisted of both discussions to obtain as much helpful information as possible and semi structured interviews.

It is vital that the collected information is right and trustworthy so that a reliable study could be carried out. Both unstructured and semi-structured interview has been carried out. The unstructured were used in advance when interviewing the buyers in order to get a dialog where the most trustworthy information was shared. This study has collected data from primary semi-structured interviews that were held with the key officials of user and vendor organizations including Bharat Petroleum Corporation Limited, SAP, IBM


Global services, ONGC, Samtel, J.K Tyre, Tata Motors, Indian Oil Corporation, Maruti Suzuki and Oracle Incorporation.

3.6.2 Secondary Data

According to Parasuraman et.al.(2005) Secondary Data are data that have already been collected by and are readily available from other sources. The secondary data consist of various documentation. It is essential to use secondary data in order to get a wider sight. For a researcher it is important to see what other researcher has done and their results within the research field (Arbnor and Bjerke, 1999). In order to further understanding of the research problem area I started by collecting secondary data.

The main advantage of starting the data collection process with secondary data was that it gave us the possibility to establish a thorough understanding of the problems related to the evaluation of ERP-system investments. Furthermore, using secondary data is relatively uncomplicated and it gave us the advantage of exploring the problem area on a step-by-step basis.

However, it is always important to be critical of the information presented in secondary sources, especially since the material might have been gathered to address a different problem area. Moreover, many secondary sources do not clearly describe issues such as the purpose of a study, how the data has been gathered, analysed and interpreted making it difficult for the researcher to assess their usefulness. In order to address this problem I have tried to triangulate the secondary data by using numerous independent sources.

The information about relevant literature is collected from the Libraries, CD-ROM databases and the Internet. The literature on evaluating ERP-systems is very limited, but it was fairly straightforward to find material in the related field of IT evaluation. Due to the rapid development of the IT sector, in regard to new products and applications, we have focused on as recent material as possible. In order to get access to the latest developments in this area a number of articles published in academic journals and trade magazines have been used. We have also used secondary

13 A. Parasuraman, Dhruv Grewal, R. Krishman (2005), Marketing Research, Biztantra, New Delhi., p.43.
information from Internet based discussion forums, ERP-system product information from suppliers and some company specific material.

(i) Earlier Studies on Subject

Many studies has examined company data, or industry report that act as a basis for the proposed study (Cooper, Schindler, 2008)\(^ {15}\). The studies related to the title of this report, were studied evaluate methods for implementation of ERP Systems that suits various functional departments in the organisations. To fulfill the purpose, I needed to find some background information about ERP systems in general, its benefits and the risks that implementations of ERP systems bring. The benefit of making an extensive literature study is to find out what the theory claims about the topics in focus. The disadvantage however, is that it is hard to find theoretical studies that suit the company’s unique existence. Consequently, assumptions and adjustments had to be made.

(ii) Accounting and financial records of respective companies

These are invaluable in the identification, clarification and prediction of certain problems. Accounting records can be used to evaluate the success of various marketing strategies such as revenues from a direct marketing campaign. There are several problems in using accounting and financial data. One is the timeliness factor – it is often several months before accounting statements are available. Another is the structure of the records themselves. Most firms do not adequately setup their accounts to provide the types of answers to research questions that they need. For example, the account systems should capture project/product costs in order to identify the company’s most profitable activities.

\(^ {15}\) Donald R Cooper, Pamela S Schindler (2008), Business Research Methods, 9\(^ {th}\) ed., Tata McGraw Hill, New Delhi, p.97.
(iv) Annual Reports of Sample Companies

Annual reports of the respective companies including SAP, Bharat Petroleum Corporation Ltd, TATA Steel has been collected and analysed for bringing out some inferences.

(v) Magazine and Newspaper articles

Magazine and Newspaper articles have also been referred in the course of study to understand the views of many professionals.

(vi) Miscellaneous Reports

These can include such things as inventory reports, service calls, Also the company’s business plan and customer calls (complaints) log can be useful sources of information. Plus also include lots of resources such as given below:

(a) Central Government
(b) State Governments
(c) Market Research agencies
(d) Trade associations
(e) General business publications
(f) Magazine and newspaper articles
(g) Annual reports
(h) Academic publications
(i) Library sources

3.7 Limitations of the Study

Since ERP systems are cross-functional by nature, their impacts on the organizations implementing them can be quite extensive. Many studies are available on the topic of ERP software and its implementation. Perspectives include project management, change management, knowledge management, communication, risk management, training, data conversion, etc. This study focuses on the perspective of project management, because of its important role in achieving overall success in an ERP project.
3.8 Evaluation Methods Used

When it comes to the methods used for evaluating the proposed investment, there are a number of available alternatives including both the traditional financial calculation models, such as the return on investment (ROI) and cost benefit analysis (C/B), but also models that try to evaluate the proposed investment using alternative approaches.

3.8.1 Return on Investment

The most commonly used approach for evaluating investments today is the return on investment (ROI). The ROI approach includes a number of techniques that try to estimate what financial return an investment will generate, i.e. the cash flow of the company, including the initial investment cost. This approach tends to be used by companies with tight financial disciplines (Farbey et al., 1999)\(^\text{16}\).

ROI is based on the idea that all costs and benefits can be transformed into measures, i.e. the costs and benefits are quantified in monetary terms, which makes it easier to comprehend for the people involved in the decision making process. However, this approach will encounter problems if the value of the ROI is zero or negative, if the costs and benefits are not easily translated into monetary terms, or if there is no casual connection between the ERP-system investment and the accomplishment of the decided business goals.

The main benefit from using one of the ROI models is that by using this technique it will be easy to rank the different investment alternatives, but at the same time it is difficult to identify the qualitative benefits (which might be a part of an ERP-system investment) and hence the evaluation of the investment alternatives might not be correct.

ROI evaluation models are preferably used when making rationalisation investments where the costs and benefits derived from the investment are direct and quantifiable, i.e. when the investment is expected to produce direct savings or benefits. At the same time these estimates can be supported by accurate calculations and there is a low level of uncertainty concerning the result of the investment.

It may also be favourable to use one of the ROI models if there are a number of investment alternatives, and there is a need to compare these in a standardised

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financial order. On the other hand, the weaknesses of the ROI models are revealed when the benefits can not easily be transformed into financial measures, if there is a high level of uncertainty concerning the calculations, or if the intangible benefits are not taken into account due to the fact that they are difficult to translate into monetary terms.

Considering these strengths and weaknesses of the ROI methods, this approach to evaluating investment alternatives is preferably used when the investment can be identified as cost reducing.

There should also be a high level of certainty concerning the result of the investment, all effects of the investment can be translated into financial measures, that the same time-scale is used for comparing all the alternatives, and that the investment should be on a tactical or operational level. It is also of importance that the company’s environment, both internal and external, is relatively stable and that the management has a strong focus on the financial measures provided by the ROI and at the same time has confidence in standardised methods of evaluation.

As ROI methods have problems with quantifying intangible costs and benefits, which may be very substantial when investing in IT, the usage of a sensitivity analysis can increase the correctness of the result of a ROI evaluation. Based on the issues identified above, it can be said that by only using a ROI method, more strategic investments are likely not to be approved unless the ROI is complemented with some other method. (Farbey et al., 1999)

3.8.2 Return on Management (ROM)

Return on management (ROM) focuses on measuring the productivity of a company’s management. The calculation of the ROM uses the additional financial value that can be directly linked to the management of the company after an investment has been carried out as a base on judging the investment. The financial value of the management is the value after all costs of the investment have been paid, and this is then divided by the cost of management. By estimating these costs and benefits of an investment, it is possible to use this as an *ex-ante* evaluation method, but due to the difficulties in making these estimations, this method is preferably an

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17 Ibid (Farbey et al., 1999)
approach to be used for \textit{ex-post} evaluation. However, given a large database of such \textit{ex-post} computations, it is possible to classify projects in order to associate type of application with ROM and thus help in defining, on an \textit{ex-ante} basis, which type of application appears to have the best chance of achieving a high ROM. (Farbey et al., 1999)\textsuperscript{18}

The purpose of ROM is to supplement the ROI method as a technique to evaluate IT-investments. One of the advantages with this method is that it focuses on the management of the company, and at the same time it is relatively inexpensive to perform. On the other hand, a disadvantage is that the value, that is seen as a financial benefit produced by the management, can not always be related to this part of the company, and hence there might be changes in the ROM that are not a result of good management (Projekt Janus, 1999a). ROM is a method to be used for establishing working relations between the IT department and the company’s management. At the strategy formulation phase, changes in ROM must be based on an estimate of revenue after the change is implemented and estimates of changes to resource costs and contributions. (Farbey et al., 1999)

3.8.3 Cost-Benefit Analysis

The decision to implement an ERP software is a business investment decision, hence, the ERP investment decision must create measurable business benefits that justify the acquisition costs and costs of implementation (Mary Sumner, 2009)\textsuperscript{19}. The main goal of the Cost Benefit (C/B) analysis is to put a financial value on every effect derived from an investment, e.g. if the goal with an ERP-system investment is to improve the working environment for the employees of the company, then the goal can be put in terms of lowered recruitment and education costs, which are derived from what is presumed to be a lowered staff turn-over. This means that all costs and benefits will get a certain value, which can be used in one of the ROI models.

The costs and benefits, which have no obvious market value or price, will be assigned a monetary value based on some notion of valuation. Due to the connection to the ROI methods, C/B analysis also requires a stable business environment. The

\textsuperscript{18} Ibid (Farbey et al., 1999)

C/B analysis is especially useful when a number of effects of the investment are intangible, but all the people involved in the investment process agree on the actions taken to measure and evaluate these costs and benefits.

The main advantage of this approach is that the costs and benefits will be quantified and this makes it possible to use this information in combination with other quantitative evaluation models. One weakness with this approach is that some of the values given to certain costs and benefits will be seen as ‘constructed’ and thus the reliability of the evaluation might decrease. A second problem with the C/B analysis is that it might take a long time to get the results and it requires good analysts.

This technique might also overlook the problems related to risks with the investment, and it does not consider costs and benefits that are too difficult to quantify and due to this the C/B analysis might encourage companies to make low risk investments.

Based on this, it can be said that the C/B analysis is best suited as an investment evaluation tool when the company is able to quantify the results of the investment and has plenty of time to conduct the evaluation. Due to the lack of consideration of risks and the necessity of good analysts, the C/B analysis is best suited for the process of determining what the company generally needs rather than at the time of specification, which means that this method is well suited for strategic investment evaluation.

### 3.8.4 Critical Success Factors

Using critical success factors (CSF) is well-known strategic approach to evaluating investments, based on the idea that top management discuss which are the CSF of the company or an investment. By focusing on these factors, the management will be involved with and devoted to the investment and hence they will support an investment that will help the company strengthen these factors. (Farbey et. al., 1999)\(^{20}\)

An advantage with this approach is that by using CSF, the company focuses on the questions that are seen as most important. During a further evaluation of the investment alternatives, it is possible to see how an

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\(^{20}\) Ibid (Farbey et. al., 1999)
investment in an ERP-system can support management in dealing with these factors. A negative aspect of this method is that it is not possible to use CSF to deal with future strategic opportunities, nor can it be used to identify information that supports or creates advantages compared to the competitors. CSF is a method that can be used when it is important to study involvement management in the implementation process.
Chapter 4

CHALLENGES TO IMPLEMENT ERP SOFTWARE

4.1 Process of ERP Implementation
4.2 Effects of ERP on Organisation
4.3 Impediments in ERP Implementation
4.4 Symptoms of ERP Implementation failure
4.1 Process of ERP Implementation

Whether the implementation involves a stand-alone software solution or is part of a larger project, one methodology may be suggested for successful implementation that includes eight distinct phases. Each phase has definite deliverables that must have management support and project steering committee buy-in before the next phase can begin. Following eight phases have been suggested: (Vishal Bishnoi, 2005)\(^1\):

i. **Project Scope**: This phase takes place immediately after the conception of an idea to implement ERP. The implementation team defines the scope and parameters of the project, establishes the milestones to measure progress, and sets up the communication and reporting procedures. Outputs of this phase include a broad outline of the implementation schedule and basic project milestones. These initial efforts help by explaining the software's capabilities and expected benefits to the project team members, management and direct and indirect users.

ii. **System Analysis**: This is a crucial phase, that takes substantial time, in this phase firstly, the business environment and processes are examined and evaluated. Defined corporate and production goals are prioritized. second, a final implementation schedule is prepared. outcomes of this phase include a formally documented objectives, and the Technical and organizational implementation aspects.

iii. **Prototyping**: The goal of this phase is to build, test, assess, and refine the initial prototype. The project team should start with a portion of the organization or a product line on which to build this first iteration, depending on the business goals and may or may not include all of the functional modules. When the prototype has been built, tested, and run, results are collected for performance evaluation, and required modifications are done. The outcome of this phase is a “detailed project notes”.

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The company's working team and users get a chance of training in the ERP's technology, functional modules, maintenance, and operations too. The benefits of successful implementation of prototype can then be sold to the rest of the organization to minimize the resistance to change.

iv. Construction: Once the prototype has been modified accordingly and accepted, it can be built for operational modules. This phase includes data collection, process modeling, and expending the basic prototype. At this stage, supervisors and users will receive additional training regarding product working and capabilities, and for any business process changes that may affect them or their work groups current way of working.

v. System Integration: At this stage all necessary interfaces are designed and integration of functional modules is done to ensure that the software works correctly with other subsystems. Main outcomes include delivering all files, specifications, working and maintenance procedures to the company's IT team, and ensure that effective training take place.

vi. System acceptance and testing: This phase involves complete testing of the live system to check its performance against acceptance criteria and the performance of its functional modules. Its key deliverable is acceptance of the system.

vii. System Changeover: It's a strategic decision, the success of ERP project depends greatly on this decision. Therefore, a strategy should be formulated for the execution of effective and efficient cutover. The changeover may either be phased or immediate; each approach has its own advantages and shortcomings, the selection of suitable approach depends on which will adversely affect organization and cause the resistance to change the least.

viii. System Evaluation and Maintenance: To ensure continuous performance, a post-implementation check should be performed after the system has been installed and working for some reasonable time to test whether or not the expected ROI and commercial benefits are being realized. This first audit may be asked to be performed by the implementation partner to give the inhouse EDP team an idea of the company's post-implementation progress.
After that, it is necessary to periodically audit the system's performance to ensure continuous performance for maximum ROI.

4.2 Effects of ERP Implementation on Organisation

Implementing an ERP system is a major project requiring a significant level of resources, commitment and changes throughout the organization, often the ERP implementation project is the single biggest project that an organisation has ever undertaken.

As a result, the issues surrounding the implementation process have been one of the major concerns in industry and it further difficult because of numerous failed cases including a few fatal disasters which has lead to the closure of some companies. ERP implementation in a multinational company has a profound effect on the workplace and on the individuals at work.

A project team should be selected from the most competitive personnel, that should be composed of a Project Manager and a multidiscipline team of key Users, I.T. specialists, outside Consultants. In a multinational company, Head Office personnel may be much in evidence in the local country, A balance should be maintained between the interests of a corporate model and the local legal, fiscal and business practice imperatives.

ERP implementation does often result in a necessity for Business Process Re-Engineering in parallel, since it has been realized that forcing the ERP to match existing Business Processes meant heavily customizing the solution. Focus should be on choosing the right package with the best fit, and then to Redesign Business Processes. ERP system tends to break down division and hierarchical barrier, Information is shared across the Organization need to be entered once only.

This phenomenon of the ERP solution, i.e. to run over existing processes, brakes up hierarchies and functional divisions of the organization and creates a
climate of perpetual change and causes great “resistance to change” in the organization, therefore, ERP Implementation project can not be operated in isolation. Project team has to work closely with the Top management and key managers of the company.

This helps the implementation team to understand the scope, needs and expectations of stakeholders, and is therefore critical to ERP project success. In fact ERP system is computer software after all. Therefore, the involvement of the organization’s system department is necessary. The figure 4-1 clearly presents the ERP system’s change environment:

**Figure 4-1: Change Environment of ERP System**

![Figure 4-1: Change Environment of ERP System](image)

Source: Adapted from “Critical factors for successful ERP implementation: Exploratory findings from four case studies”, Motwani et.al, 2005.²

A above figure demonstrates a model for the successful implementation of ERP software, Chan-Hsing Lo(2005)³ in his paper “A Case Study of ERP Implementation in Opto-Electronics Industry” has given some checklist that can be used to determine if an ERP system has been successfully implemented:

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ERP systems are designed to enhance organization’s competitiveness by upgrading an organization’s ability to generate timely and accurate information throughout the enterprise and its supply chain. A successful ERP system implementation can shorten production cycles, increases accuracy of demand for materials management and sourcing and leads to inventory reduction because of material management, etc. Moreover it can be used as a primary tool for re-engineering.

However, various studies have revealed that not all ERP implementations are successful. According to Gray A. Langenwalter “ERP implementation failure rate is from 40% to 60%”, yet companies try to implement these systems because they are absolutely essential to responsive planning and communication. (Asim Raj Singla, 2008)\(^4\)

Multinationals looked toward reengineering and cost cutting and often combined their ERP project with the breaking down of country barriers for Manufacturing sites, Centers of Distribution. The Effect on the organizations is more people oriented than systems oriented. Systems are necessary and useful but can never be a replacement. Some organizations are driven by systems, I.T. system is there to support an organization and not the other way around.

It was realized that forcing the ERP to match existing Business Processes means heavily customizing the solution, therefore emphasis shifted to choosing the right package with the best fit, and then to adapt Business Processes.

Another factor is that ERP tends to break down division and hierarchical barriers. Information shared across the Organization has only to be keyed in once. The ERP solution run over existing processes, hierarchies and functional divisions shakes up the organization and creates a climate of perpetual change.

According to C. Leana and B. Barry (2005)\(^5\) organizations increasingly are pursuing change in how work is organized, how it is managed and in who is carrying

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The advantage of change to the organization is the ability to quickly adapt to environmental changes, explore new ideas or processes, reduce fixed costs, and in the end have an advantage over competitors. Change also stimulates the individual providing variety in their work, fulfilling self development needs, maintaining interest in and satisfaction with their jobs.

The contention is that change and stability are simultaneous experiences in organizations, and that some level of change is an inevitable part of any organizational life. Stability and change are both necessary for organizations to function effectively. Stable patterns of behavior evoke perceptions of interpersonal trust which in turn clears the way for more flexible and adaptive subsequent behavior. (Leana and Barry, 2000)\textsuperscript{6}.

S.K. Piderit (2000)\textsuperscript{7}, in one of his article, discusses the positive as well as negative aspects of resistance to change. Successful organizational adaptation generate employee support and enthusiasm for proposed changes, rather than merely overcoming resistance. In addition, we need to see the reasons behind resistance, especially if they are unselfish, and not just the resistance as a threat.

It has been observed in some instance, the employee started off enthusiastic but became ambivalent due to lack of top management support, co-workers’ laxity and what he perceived as the dangers of a behemoth project (Piderit, 2000)\textsuperscript{8}. The ERP solution needs to be put in perspective, it should support rather than to drive the business.

However, the consequences on the organization are very far reaching, the ERP implementation challenges processes, functions and hierarchies and fosters a climate of perpetual change. One factor in reducing the failure rate is the maintaining of a balance between stability and change; and the need for accompanying of change.

\textsuperscript{6} Ibid Leana and Barry (2000)
\textsuperscript{8} Ibid (Piderit, 2000)
There is a consensus among authors that it is largely the implementation itself which is painful and the source of failure. Further analysis of success or failure factors show that primarily it is the implementation’s effect on Organization, the Workplace and the Individuals at Work which yields a positive or negative result. Laughlin puts this clearly by stating that ERP implementations do not fail because the applications does not work, they fail because the enterprise rejects them.

However, as a paradox, ERP implementation does often result in a need for Business Process Re-Engineering in parallel. Early on it was realized that forcing the ERP to match existing Business Processes meant heavily customizing the solution, a handicap when a new version had to be assimilated at a later date. Emphasis shifted to choosing the right package with the best fit, and then to adapt Business Processes.

Another factor is that ERP tends to break down division and hierarchical barriers. Information shared across the Organization has only to be keyed in once. This ‘arrogance’ on the part of the ERP solution, i.e. to run roughshod over existing processes, hierarchies and functional divisions shakes up the organization and creates a climate of perpetual change.

C. Leana and B. Barry (2000) commented that organizations and individual employees increasingly are pursuing change in how work is organized, how it is managed and in who is carrying it out. The advantage of change to the organization is the ability to quickly adapt to environmental changes, explore new ideas or processes, reduce fixed costs, and in the end have an advantage over competitors. Change also stimulates the individual providing variety in their work, fulfilling self development needs, maintaining interest in and satisfaction with their jobs.

The change and stability are simultaneous experiences in organizations, and that some level of tension is an inevitable part of any organizational life. Furthermore, stability enables rather than impedes change. Stability and change are both necessary for organizations to function effectively. Stable patterns of behavior evoke

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9 Ibid (Leana and Barry, 2000)
perceptions of interpersonal trust which in turn clears the way for more flexible and adaptive subsequent behavior. (Leana and Barry 2000)\textsuperscript{10}.

In an article by S.K. Piderit (2000)\textsuperscript{11} discusses the positive as well as negative aspects of resistance to change. Successful organizational adaptation is increasingly reliant on generating employee support and enthusiasm for proposed changes, rather than merely overcoming resistance.

In addition, we need to see the reasons behind resistance, especially if they are unselfish, and not just the resistance as a threat. The article is not on the theme of ERP solutions, but it is interesting that one of three concrete examples results from an interview with a middle manager in a large, diversified company, describing his response to the restructuring and centralization of his company around a new enterprise-wide software system. In some instances, the employees started off enthusiastic but became ambivalent due to lack of top management support, co-workers’ laxity and what he perceived as the dangers of a behemoth project.

Currently in multinational ERP system implementations, the project team functions along these lines; in perpetual movement and calling upon resources and methods as and when needed and like an organism that breathes. No one person dominates other than to make a concrete contribution and retire until the next time his or her knowledge adds value

The people focus is often missing and may explain a part of project failure. As Miller A. (2001)\textsuperscript{12} points out that 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. This means helping the 45 or 50 year old key user with 15 or 20 years hands on business experience to become an internal consultant in SAP, JDE, or PeopleSoft, etc.

\textsuperscript{10} Ibid (Leana and Barry 2000)
\textsuperscript{11} Ibid S.K. Piderit (2000)
To summarize, ERP implementation impact on the workplace and on individuals at work in the context of a multinational, the project implies working not only with the existing colleagues, but also with Head Office project people and outside Consultants with their own culture and languages. It means an upheaval of existing work methods the breaking down of barriers between countries, sites, functional divisions and hierarchies. Self interest, defending of turf, internal politics, problems of person can of course continue to predominate and derail a project, but the successful project will push these intangibles to the background or eradicate them toward a greater good, project success and win-win for organization and individuals alike.

The successful project is characterized by the synergy of a new generation of knowledge workers, interested in project advancement, coming together, separating, regrouping as the project dictates. We can identify a key success factor as the ability of traditional management to give free reign to this new way of interacting that is, in other words, the centralization of data and processes, decentralization of non added value functional or hierarchical divisions, and the admittance of an ‘unmanaged’ project team. The standards of measure should be increased productivity and competitiveness, increased flexibility and adaptability and continuous change.

The benefits of ERP in any organization are listed below as given by Garg and Venkitakrishnan. (2006)\(^\text{13}\)

(a) Reduced Planning cycle time
(b) Reduced manufacturing cycle time
(c) Reduced inventory
(d) Reduced error in ordering
(e) Reduced requirement of manpower
(f) Enables faster response to changing market situations
(g) Better utilization of resources
(h) Increased customer satisfaction
(i) Enables global outreach
(j) Reduction in Job Time

Benefits from ERP are mainly of two kinds:

**Tangible Benefits**: Tangible benefits are those benefits which can be quantified in monetary terms. Many researches have been held to study the tangible benefits that are generally derived of the ERP implementation in organizations. According to a survey of 62 Fortune 500 companies by Benchmarking Partners, Inc. for Deloitte Consulting, the most important tangible benefits realized after successful implementation of ERP system. The survey results are given in table given below:

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Tangible Benefits</th>
<th>% of Companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Revenue / Profit Increase</td>
<td>11</td>
</tr>
<tr>
<td>2</td>
<td>Inventory Reduction</td>
<td>32</td>
</tr>
<tr>
<td>3</td>
<td>IT Cost reduction</td>
<td>14</td>
</tr>
<tr>
<td>4</td>
<td>Procurement Cost reduction</td>
<td>12</td>
</tr>
<tr>
<td>5</td>
<td>Transportation / Logistics Cost Reduction</td>
<td>9</td>
</tr>
<tr>
<td>6</td>
<td>Maintenance Reduction</td>
<td>7</td>
</tr>
<tr>
<td>7</td>
<td>Personnel reduction</td>
<td>27</td>
</tr>
<tr>
<td>8</td>
<td>Productivity Improvement</td>
<td>26</td>
</tr>
<tr>
<td>9</td>
<td>Cash Management Improvement</td>
<td>11</td>
</tr>
</tbody>
</table>

*Source:* Adapted from Mary Sumner (2009)\(^{14}\)

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Intangible Benefits: Intangible benefits are those that cannot be quantified in monetary terms but they do have a very positive and significant business impact. Information availability is a big factor. Information can enable managers to make better decisions about how to allocate resources effectively. In addition, improved customer responsiveness, process integration, and increased flexibility though intangible, can lead to tangible benefits (Mary Sumner, 2009)\textsuperscript{15}. The table given below gives some of the important findings on intangible benefits:

**Table 4-2: Intangible benefits with ERP**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Intangible Benefits</th>
<th>% of Companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Information visibility</td>
<td>55</td>
</tr>
<tr>
<td>2</td>
<td>New / improved process</td>
<td>24</td>
</tr>
<tr>
<td>3</td>
<td>Customer responsiveness</td>
<td>22</td>
</tr>
<tr>
<td>4</td>
<td>Process Integration</td>
<td>13</td>
</tr>
<tr>
<td>5</td>
<td>Product Standardization</td>
<td>12</td>
</tr>
<tr>
<td>6</td>
<td>Flexibility</td>
<td>9</td>
</tr>
<tr>
<td>7</td>
<td>Globlisation</td>
<td>9</td>
</tr>
<tr>
<td>8</td>
<td>Business Performance</td>
<td>7</td>
</tr>
<tr>
<td>9</td>
<td>Supply / Demand Chain Efficiency</td>
<td>5</td>
</tr>
</tbody>
</table>


\textsuperscript{15} Mary Sumner (2009), “ Enterprise Resource Planning”, Person Education, New Delhi, p.10
Based on various research papers and studies followings have been identified as the major benefits of ERP Systems:

i. **Lowering the cost of products and services purchased:**

   ERP software definitely enables the required monetary benefits to organizations whether they are in practice of built in systems or individual practices. If we are to calculate the costs involved in preserving and building them over a period of time it will be evident that the ERP costs incurred to support and facilitate the said functions will be comparatively less.

   Organizations generally tend to go for ERP with an intention to improve or increase the efficiency of a particular section/department. Also, the costs incurred to implement that particular function must be economically feasible for the organization. Everything has to be calculated on the basis of the chosen ERP software systems.

ii. **Reduction in Operating Costs**

   ERP software attempts to integrate business processes across departments onto a single enterprise-wide information system. The major benefits of ERP are improved coordination across functional departments and increased efficiencies of doing business. The immediate benefit from implementing ERP systems we can expect is reduced operating costs, such as lower inventory control cost, lower production costs, lower marketing costs and lower help desk support costs.
iii. Improves the productivity of personnel:

It was found that average percentage of the time managers spend in implementation work i.e. chasing people, data acquisition etc., reduce for all management levels across all locations. It has been found that some plant experiences highest change which averages 51% reduction, however, average reduction is 31% to 38% in general. Across management levels this reduction is around 37% for junior and middle levels and 45% for senior level.

Senior and middle management level experience major improvement in this majority of respondents said that ERP has led to better co-ordination in terms of accessing information, resources, people etc. to a large certain. Nearly 64% managers are of opinion that ERP has changed the ways they used to do work to a large certain and 32% feel that they are affected to some extent only. 54% users said that ERP has resulted in impact on the culture and goal setting in the organization to a large certain and 43% says that this impact is to some extent. 63% managers said that ERP has changed the ways they serve their customers to a large certain and 30% says that this change is to some extent. With ERP implementation average decrease in order to ship time after ERP implementation is 36%.

The questionnaire revealed that the flexibility of the organization had increased substantially.

iv. Inventory reduction

ERP provides data regarding inventory turnover rate and inventory level; therefore help manufacturing and marketing employees to improve the inventory management processes. Such inventory information could not be provided by the old legacy MIS systems in the past. ERP systems integrate information regarding to inventory, orders, work-in-process, and production schedule. Manufacturing and marketing departments can be alerted with production problems such as part shortage so that they can handle the situations in time to ensure timely delivery of products been ordered.

v. Centralized Information

One of the major benefit of ERP systems is the centralized integration and availability of information to employees. Departments such as manufacturing and marketing will receive up-to-date data to reflect business processes and transactions
across functional areas. The information sharing is very difficult before ERP implementation.

vi. Quality Engineering

ERP systems have vastly helped to improve the quality of services and goods offered by the companies. ERP has been instrumental in identifying the areas for improvement. In the event of speeding and improving the manufacturing process or other core functions of the company.

This has greatly helped to improve the overall quality. For example in the course of implementing ERP software the company would have found some obsolete practices. They can devise a corrective measure in consultation with the ERP vendor which will improve the benefits through the ERP software implementation. Thus ERP project helps to identify the existing mistakes and improve upon them in a better manner.

vii. Economics the Resources

ERP systems also help to save on human resource, time and money not only on a large scale but also in the case of many sub process. During the course of ERP implementation the company can identify many areas where resources are not properly put in use.

This enables the company to decide on them and devise a suitable measure to properly use those resources. Such as during the course of ERP implementation the company can come to know the misallocation of the resources due to reasons like wrong organizational structure and procedures, which would not have been otherwise possible without ERP implementation.

vii Supports decision making

ERP software support has increased the autonomy and thereby the process of decision making process becomes easy in departments. Formerly departments had to get the consent and consensus from one another before finalizing or processing the end information.
ERP has eliminated this need in the right time. Individual departments can function like separate entities with good faith as they can access the information required from other departments from the system in their department.

viii. Improved Process Flexibility

Organizations have been following conventional procedures and formalities prior to ERP implementation. One needs to ask for permission to view the details or data of the other department in the same company and this had to be routed through the departmental heads, ERP system has changed this practice. Whatever an employee needs, can be immediately accessed by him subject to the delegated authority and availability. ERP function has thus helped individuals also.

4.3 Impediments in ERP software Implementation

ERP systems are difficult and costly to implement, studies have shown that a large portion of the overall implementation cost goes to consulting fees. In fact, very few organizations have the internal knowledge and skills to implement an ERP system successfully without external help.

Panorama’s ERP Report (2010)\(^\text{16}\) shows that 55.4% of companies realized less than 30% of the expected business benefits through their ERP implementations, and only 32.5% of companies realized over 50% business benefits.

It has been often observed that, many risks in ERP implementation arises due to tightly linked interdependencies of organizational processes, business data, and process reengineering (Sally Wright, Arnold M. Wright, 2002)\(^\text{17}\). Similarly, business risks drive from the models, artifacts, and processes that are chosen and adopted as a part of implementation and are generated from the firm’s operations with respect to their internal environment and their external match with business partners.

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Organizational risks arise from the environment including personnel and organizational structure in which the system is chosen to be implemented (Daniel E.O’Leary, 2000)\textsuperscript{18}.

According to Umble and Umble the renowned author, three main factors that can be held responsible for failure of ERP system are:

(a) Poor project management;
(b) Ineffective Change Management
(c) Lack of business management support.

In another study, it has been found that companies spent large money in developing ERP systems that are not utilized. It is quite common for ERP project to finish late, cost more than predicted, unreliable and difficult to maintain.

Significant benefits can be realized from analyzing ERP implementation problems from theoretical perspective because of its close alignment between symptoms of ERP implementation failures and the problem areas that project management discipline addresses. According to Gray and Larson, “Quality and ultimate success of a project are traditionally defined as meeting and exceeding the expectations of the customer and/or upper management in terms of cost, time schedule, and performance of the project” (Gray and Larson, 2000)\textsuperscript{19}.

ERP implementation failures often demonstrate the inability to meet these expectations. Another study by the Standish Group on ERP projects implemented in companies with over $500 million annual revenue found that many of them had failed to achieve their goals. Based on various reports it is suggested that choosing the right consultants and using their skills and knowledge appropriately, as well as transferring and retaining essential knowledge within the organization is essential to the overall success of an ERP system implementation.

One of the main problems in ERP implementation projects is to align the software package with the business processes of the enterprise implementing it. A requirement-driven approach to the alignment problem is that matches a model of the


defined enterprise requirements with a model of the ERP system capabilities. The research identifies the essential elements of the requirements as business processes, rules, objects and required system services. The evaluation framework is applied, whose expressive power is found adequate for specifying the requirements.

The ERP system model represents the system’s functionality and the alternative business processes it supports, as well as the interdependencies among them. The research studies a generic reverse engineering process for developing the model, and analyzes the desired properties of a suitable model.

The study simulates the alignment process using requirements defined in a real-life ERP implementation project and validates the results by comparing them with the real decisions made. The results of the study establish the viability of the approach for providing a satisfactory solution to the problem of aligning an ERP software package with an enterprise business model.

The measurement of ERP success are thorny matters, firstly, success depends on the point of view from which one measures it, within a single company people will have different ideas for example, implementation specialists (e.g. project managers and implementation consultants) often define success in terms of completing the project plan on time and within budget while the user and adopter tend to focus on the transition from old systems and stable operation. Of course, the business objectives should be met such as inventory reduction and more decision support capabilities.

A Standish Group Report entitled *Chaos* speaking about Information Technology soft-ware projects in general, points to various failure factors resulting in cost or time overruns, unfulfilled objectives, cancelled projects etc. The percentage of “successful” projects in large companies was estimated at an unflattering 9 % (STANDISH GROUP 1995). Another finding was that project failures were on the increase in 1995 compared to 1990 or 1985. This Standish Group Report comments could well have applied, and arguably still do, to the implementation of ERP solutions.

Dorien James and Malcolm Wolf writing in 2000 consider that for many businesses installing ERP was traumatic. Following long, painful, and expensive implementations, some companies had difficulty identifying any measurable benefits.
Despite the fact that ERP was replacing a tangle of complex, disparate and obsolescent applications and that Editors were promising efficiencies such as shorter intervals between orders and payments, lower back-office staff requirements, reduced inventory and improved customer service. ERP was promoting common data, standard business processes, organizations that are built to change continually. All eminently laudable, yet those responsible for part of the Project team (Managers, Key Users, I.T. Specialists, Consultants) often felt that they had engaged in a marathon.

A clue to why Project implementations are often fraught with difficulties is alluded to by Rivard et al, they state that information technologies are neutral, their impact depending on the way they are implemented and used in a given environment. (RIVARD et al 1999). Correctly implemented, information technologies can facilitate and initiate important changes. Some of the important factors are:

(a) Failing to establish metrics
(b) Re-sourcing the post-implementation stages adequately
(c) Ignoring management reporting requirements
(d) Addressing resistance to change slowly or not at all

Although ERP systems have certain advantages such as low operating cost and improving customer service, they also have some disadvantages due to the tight integration of application modules and data. Huge storage needs, networking requirements and training overheads are frequently mentioned ERP problems. However, the scale of business process re-engineering (BPR) and customisation tasks involved in the software implementation process are the major reasons for ERP dissatisfaction.

Baan, PeopleSoft, as well as SAP calculate that customers spend between three and seven times more money on ERP implementation and associated services compared to the purchase of the software license (Scheer and Habermann, 2000). This means that ERP projects are large, costly and difficult and that they require large investment in capital and staff and management time (Adam and O’doherty, 2000). Yen et al. (2002) identified the following disadvantages of ERP: its high cost prevents small businesses from setting up an ERP system, the privacy concern within an ERP system and lack of trained people may affect ERP’s efficiency. Implementation of an ERP project is painful, and customisation is costly and time-consuming. Some of
these shortcomings have been discussed by O’Connor and Dodd (2000). There are number of factors that act as challenges to successful ERP implementation. The result of survey conducted through interviews among User and Vendor/Implementation organizations revealed the following major challenges

Table 4-3: Some major challenges in the Implementation of Enterprise Resource Planning system

<table>
<thead>
<tr>
<th>Rank</th>
<th>Factors</th>
<th>Response (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Resistance to change</td>
<td>80</td>
</tr>
<tr>
<td>2</td>
<td>Successful changeover to ERP</td>
<td>75</td>
</tr>
<tr>
<td>3</td>
<td>Project management</td>
<td>65</td>
</tr>
<tr>
<td>4</td>
<td>Lack of organization wide training</td>
<td>65</td>
</tr>
<tr>
<td>5</td>
<td>Un-releastic expectations</td>
<td>60</td>
</tr>
<tr>
<td>6</td>
<td>Cost Overrun</td>
<td>55</td>
</tr>
<tr>
<td>7</td>
<td>Time overrun</td>
<td>45</td>
</tr>
</tbody>
</table>

Source: Calculated from respondant’s responses, Vishal Bishnoi (2010)

ERP system is an IT solution that helps organizations to achieve enterprise wide integration which results in faster access to accurate information required for decision making. ERP has its roots in manufacturing as the name is an extension of Manufacturing Resource Planning (MRP II) (Davenport, 2000).

A Standish Group Report entitled Chaos speaking about Information Technology software projects in general, points to various failure factors resulting in cost or time overruns, unfulfilled objectives, cancelled projects etc. The percentage of “successful” projects in large companies was estimated at an unflattering 9%.

This Standish Group Report comments could well have applied to the implementation of ERP solutions. Dorien James and Malcolm Wolf writing in 2000 consider that for many businesses installing ERP was traumatic. Following long, painful, and expensive implementations, some companies had difficulty identifying any measurable benefits. (James and Wolf, 2000)\textsuperscript{20}.

\textsuperscript{20} Ibid (James and Wolf, 2000)
Note that this is despite the fact that ERP was replacing a tangle of complex, disparate and obsolescent applications and that Editors were promising efficiencies such as shorter intervals between orders and payments, lower back-office staff requirements, reduced inventory and improved customer service. ERP was promoting common data, standard business processes, organizations that are built to change continually. All eminently laudable, yet those responsible for part of the Project team (Managers, Key Users, I.T. Specialists, Consultants) often felt that they had engaged in a marathon.

A clue to why Project implementations are often fraught with difficulties is alluded to by Rivard et al, when they state that information technologies are neutral, their impact depending on the way they are implemented and used in a given environment. (Rivard et al 1999)21. Correctly implemented, information technologies can facilitate and initiate important changes.

Enterprise Resource Planning solutions are neutral, they provide integrated modules across all organizational functions including Finance, Logistics and Manufacturing. Addition of Customer Relationship Management software brought together the sales, marketing, and customer service.

Stephen Laughlin says “You will underestimate and fail to appreciate the degree of change an ERP solution causes” and recommends that a partner as integrator needs to have a holistic approach, business application, technology and people perspective, and not just a focus on only implementing the particular application.

In short, I.T. software projects often ‘fail’ and ERP implementation projects do not escape this tendency. At the same time ERP solutions do not fail primarily for technical reasons, and when their offer is examined in detail are commonsense and practical in response to business problems and opportunities.

There is a consensus among respondents that it is the successful implementation mainly which is painful and the major cause of failure in most projects. Further analysis of success or failure factors show that primarily it is the implementation’s effect on Organization, the Workplace and the Individuals at Work which yields a positive or negative result.

21 Ibid (Rivard et al 1999)
Laughlin puts this clearly by stating that ERP implementations do not fail because the applications does not work, they fail because the enterprise rejects them. Difficulties in implementations of Enterprise Resource Planning (ERP) software are widely documented. Review of selected literature published between January 1995 and 2010 identifies major prerequisite elements that can facilitate successful Enterprise Resource Planning implementations.

These elements are related to specific project management problem areas that use grounded theory coding analysis and constant comparison. Results of the analysis are presented for project managers as a list of recommendations related to project scope, quality, time, cost and expectations.

(i) Resistance to change: In Enterprise Resource Planning implementation the employees together are able to make a success, or a failure, or neutralize technical systems, especially complex systems such as Enterprise Resource Planning.

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. In order to be able to analyze problems and evaluate needs, one should remain attentive to people and social behavior so that it can help in educating people both to individual by explaining what the ERP modules are doing and how to use them and how to integration of ERP in each department or service will improve the various processes. For example, mastering all the new accounting capabilities of the ERP Finance module requires to build 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 organization.

Technology is resisted because it has got its own principle of reality such as ERP by itself will never be able to deliver manufactured goods, only a coordinated organization can do so. Social organizations 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 technologies such as fax or mobile phones have spread.
The discourse about the “technological advantage” 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 so called “techno-stress” among staff at all levels of an organization as 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. Major factors that have been identified for generating “techno-stress” are:

(a) System problems
(b) Computing errors
(c) Training Problems

Besides, according to various surveys, it seems that “techno-stress” is more and more affecting executives and managers. They fear I.T. 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 a lack of knowledge.

Managers who frequently avoid technologies and suffer from a lack of technical knowledge, have nevertheless to make decisions about buying expensive I.T. 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 I.T.

In short, the preceding human factors are paramount when it comes to ERP implementation and may explain to some extend why an ERP needs a lot of care and support when deployed in an organization both by internal management and external consultants.

(ii) Effective Change Management

Risks are inherent in projects (Gray and Larson, 2000)\(^{22}\). According to O’Leary, ERP implementation risks can be categorized as technical, business or organizational. Furthermore, risks from each category appear throughout the entire project, from making implementation decision to going live (O’Leary, 2000)\(^{23}\).

\(^{22}\) Ibid (Gray and Larson, 2000)
\(^{23}\) Ibid (O’Leary, 2000)
Therefore, risk management really should consider all problem areas of project management. One should have a concrete action plans beforehand to mitigate risks, hence effective risk management acts as key to success.

O’Leary and Daniel (2000 in their book “Enterprise Resource Planning Systems – Systems, Life Cycle, Electronic Commerce and Risk” explain these effects on the ERP life cycle. The purpose of this study is that the researcher focuses on the implementation stage of the life cycle.

These analyses of ERP risks and the effects on implementation lay a foundation for the recommendations presented in the Conclusion and Recommendations chapters of this research report.

(iii) System Integration Management

Another major difficulty is that an ERP system involves a serious transformation process that requires fundamental change in the way business processes are designed and conducted. Many methodologies have been suggested to ensure the package is implemented in a manner that ensures the quality output of the ERP system, i.e. that the system is implemented in an efficient way and the objectives are met (Stefanou, 2000)24. Most of these methodologies insist on preparing properly and thoroughly from the chartering phase itself prior to acquiring or implementing any technologies. The problem inherent in such ideas is that this is precisely the stage in a project where managers’ awareness levels are at their lowest and when they are least able to make key choices, hence the recourse to external parties which, unfortunately are rarely independent and un-biased.

ERP is seen as a necessary cost avoidance investment. This was confirmed in a survey question aimed at soliciting team members’ understanding of the expected benefits to be delivered by the new ERP system. There was a general acceptance that the benefits to be derived from the ERP roll-out were for the “greater good” of the corporation, rather than any particular advantage to be derived from the local site.

(iv) Project Communications Management

It has been observed that organisations find it very difficult to communicate internally, each department viewing its information as its own and being reluctant to share it (Scott and Kaindl, 2000)\(^{25}\). Indeed, implementation team members discovered that it was easier to learn and share experiences with people from outside their organisation than within intra-organisational teams.

This is where the primary benefit of using consultants to aid implementation is apparent as they add value to the project by facilitating meetings and the open discussions of requirements, prioritising issues and avoiding conflicts. Thus, consultancy agencies are important in ERP projects despite the possible lack of technical experience or knowledge because they facilitate open and productive communication.

In order to concentrate on communication between the project team and the other employees at the plant, countless meetings, particularly with representatives of the , where extremely sensitive negotiations with respect to changes to job specifications were navigated to success with requisite care and attention.

(v) Efficient project controls on schedule and activities

Project feedback and controls are the heart of project management (Gray and Larson, 2000)\(^{26}\), however, this process is especially critical in a large project such as ERP implementation and hence is identified as one of the difficulty area. Frequent feedback / updates of project status and progress should be used for timely corrections and keep the project on track (Somers and Nelson, 2001)\(^{27}\). Tightly controlled project scope and time reduce ERP implementation cost.

(vi) Smooth and Tactful Change Management

One should carefully plan the transition phase, such as enterprise may go for phased implementation, immediate cut-over, and parallel operations (simultaneous processing in the current and the new systems) so as to increase the probability of successful ERP implementation. It is important to keep in mind that organizational changes due to ERP implementations can be both evolutionary and revolutionary

\(^{25}\) Ibid (Scott and Kaindl, 2000)

\(^{26}\) Ibid (Gray and Larson, 2000)

(Boudreau, 1999)\textsuperscript{28}. The implication of change and transition to project management is very critical for successful implementation of ERP system.

\textbf{(vi) Project and Cost management}\textsuperscript{29}

Depending on the size of the organisation and the scope of the project, implementing an ERP system may even take years because of the need to be rolled out across multiple sites, lines of business and countries. In the case of global roll-outs at MNCs, project time management is critical during the chartering, project and shakedown phases. In case of some MNCs, the four waves of the implementation programme ran over a period of over five years. In fact the timescale of the global roll-out was so long that by the time the last site was up and running, the implementation team had to re-start the whole cycle again in order to upgrade the version of the system used by the original sites.

Evidently, the length of implementation is greatly affected by the scope of the project, i.e. more activity regarding modules, sites and functions means a longer process. A large proportion of the implementation time is consumed by customising the package, so the length of time could be substantially reduced by keeping the system as simple as possible and reducing the number of packages that require customisation in order of implementation, which has led software vendors and consultants to recommend a zero modification approach that has nowadays become a de facto standard.

Another aspect of the time management of large multi-site MNCs is the learning that can occur from each site and the core team’s ability to take on board this knowledge in a way that would make it meaningful for subsequent implementations. This will lead MNCs to sometimes sacrifice customise in the name of standardisation and expediency (Bingi et al., 1999).

This might explain why the local implementation team did not regard project management as important. The team may have perceived the required skills for the


project to be knowledge of ERP software (38 per cent), process knowledge (27 per cent), existing systems knowledge (23 per cent) and project management (14 per cent). The increased importance of “Project Management” “SAP Knowledge” and the continued importance of the “Process Knowledge” skill sets is evident. On the other hand, “Existing Systems Knowledge” and “Data Knowledge” is perceived to be less important.

4.4 Symptoms of ERP Implementation Failure

This section seeks to define the symptoms of ERP implementation failure from the project management perspective, significant benefits can result from analyzing reasons of ERP implementation failure from this theoretical perspective because of the close alignment between symptoms of ERP implementation failures and the problem areas that project management discipline addresses. According to Gray and Larson “Quality and ultimate success of a project are traditionally defined as meeting and/or exceeding the expectations of the customer and/or upper management in terms of cost (budget), time (schedule), and performance (scope) of the project “(Gray and Larson, 2000)³⁰.

ERP implementation failures often demonstrate the inability to meet these expectations. A study by the Standish Group on ERP projects implemented in companies with over $500 million in annual revenue found that many of them had failed to achieve their goals. What was used to define failure coincides with the problems that project management is supposed to solve. Table demonstrates this relationship as well as the outcome of The Standish Group study.

<table>
<thead>
<tr>
<th>Stakeholder Expectation</th>
<th>Project Management Problem Area</th>
<th>Results of ERP Implementations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stay within budget</td>
<td>Cost</td>
<td>178% cost overrun</td>
</tr>
<tr>
<td>Finish on schedule</td>
<td>Time</td>
<td>230% Longer</td>
</tr>
<tr>
<td>System performs well</td>
<td>Scope</td>
<td>59% less than expected</td>
</tr>
</tbody>
</table>

Source: Buckhout, S., Frey, E. and Nemec J., 199931

After going through different research papers and literature following major symptoms of ERP Software implementation may be given:

(a) Time Overruns
(b) Cost Overruns
(c) Achieve Less Benefits than Expected
(d) Misalignment with organizational Change
(e) Lack of Integrated IT Platform

4.4.1 Time Overruns

Time overrun means ERP Implementations take longer than Expected. Many companies have unrealistic expectations about both the duration of an ERP implementation and the investment required to go full mode with the least amount of business risk and the maximum level of business benefits. ERP system implementation durations include all activities required to fully implement software, including process design, requirements gathering, configuration, business and technical testing, and end user training. However, a significant portion of team members implement ERP in multiple phases that had not been entirely completed, so this range may under-estimate the actual duration required to fully implement a comprehensive ERP system.

According to Panorama’s study (2010) 57% of ERP implementations take longer than expected. This challenge is partly attributed to the fact that many companies in our study either had unrealistic expectations regarding timeframes

and/or did not account for key project activities in their implementation planning processes.

4.4.2 Cost Overruns

In addition to taking longer than expected, most ERP implementations cost more than expected. As illustrated in the table above, 178% of ERP implementations go over budget. This is a slight decrease from the 2008 study, which showed that 59% of implementations cost more than planned. The finding is attributed to the fact that many organizations in our study failed to identify and budget implementation costs not attributable to software vendors, such as project management, organizational change management, hardware upgrades and the like.

When considering the total cost of ownership of enterprise software solutions, the average investment costs $6.2 million, compared to $8.5 million in the 2008 study. Normalized to account for different company sizes, the average initial implementation costs are 6.9% of annual revenue, compared to 9.0% in 2008. This decrease of over 20% can be attributed to efforts to limit IT budgets and reduce implementation scopes in response to weak economic conditions. The tradeoff to these reduced implementation costs is that companies are less satisfied with their ERP investments than in years past, as outlined in the next section.

![Figure 4-4: Implementation Budget v/s Actual Cost](source)

We often warn our clients of the hidden costs associated with complex ERP implementations. Budgets that don’t take into account hardware, training, organizational change management, project management, temporary staffing and software customization are often misguided and may force a company to spend more than anticipated. Problems of this nature tend to stem from CIOs who are doggedly
determined to implement an ERP solution regardless of how much it costs or how little of a return on investment (ROI) it delivers. In addition, some companies fall prey to the "ERP sales trap" set by software vendors who understate costs during their sales efforts.

4.4.3 Achieve Less Benefits:

Many industry leaders, including Panorama Consulting Group, have published papers regarding the evasive nature of ERP benefits. Panorama 2010 ERP Report underscores this hypothesis. As revealed, 41% of companies surveyed fail to realize at least half of the business benefits they expected from their ERP systems, and 22% of implementations fail to deliver at least some measurable business benefits from their ERP solutions. In addition, over one in three companies surveyed (40%) realized major operational disruptions after implementation go-live, such as the inability to ship products or to close the books. Finally, only 68% of executives and 61% of employees are at least somewhat satisfied with their ERP solutions.

Despite the large investment most companies make in ERP software, benefits are by no means guaranteed. When comparing this year’s results to our 2008 study, we noted a direct correlation between declining ERP spends and declining levels of satisfaction. Though companies are better at containing implementation budgets in a weak economy, they appear to be cutting costs in the wrong areas (e.g., organizational change management and training). These measures may be leading to lower levels of satisfaction and less-than-desirable benefits realization. Factors such as these have a
critical effect on the ROI of the ERP investment and should be carefully managed as part of an overall ERP benefits realization plan.

4.4.4 Misalignment with organizational Change

The lack of organizational change management is a critical obstacle in the implementation of ERP solutions within a reasonable timeframe and budget and the realization of measurable business benefits. Change Management is generally the most overlooked and undervalued aspect of technology initiatives, is a comprehensive, multi-disciplinary program designed to manage the impact of organizational change, in this case change resulting from an enterprise solution implementation (Robert Pitney and Michael Paust, 2003).

While this issue has always been a factor in unsatisfactory benefits realization, it is even more pronounced in the last year because of the turbulence, uncertainty and high degree of change that most companies are experiencing. Their study finds that over 40% of organizations are dealing with significant change concurrent with a new ERP system rollout. An ERP system rollout alone will impose significant pressures on an organization and its resources.

Over 40% of companies implementing ERP software also are adjusting to either a new CEO or the addition of new office locations. In addition, 26% experience a merger or acquisition around the same time as their ERP deployment, while 19% go through layoffs (that number is trending upward in more recent data). The magnitude of these changes makes a strong organizational change management program even more imperative.

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Over 53% of implementing organizations assess their ability to deal with change as fairly poor or very poor. In addition, 47% say communication between management and employees is poor. These types of environments are not conducive to effective ERP implementations. Organizational change management tools, however, help address such barriers to make the rollouts more successful.

According to the interviews of officials of user organizations and ERP implementation consultants, over 60% of organizations suffer from poor visibility of data and poor integration in their old systems. This metric suggests that employees using a new ERP system have strong organizational resistance and steep learning curves.

Poor integration between functional areas in the old system was cited by 64% of organizations as a driver for a new system, followed by poor visibility to operational data and reports (62%) (Survey by researcher, 2009). These metrics underscore the magnitude of change that implementing a single, integrated enterprise software system such as ERP or CRM entails. An effective organizational change management plan is critical to helping employees understand and leverage the newfound operational visibility in the new system.

The main objectives for company in their IT business project included harmonizing processes and centralizing data, performing processes efficiently, providing tools for increased decision making support, and improving customer service. The IT impacts on business processes of a company in respect to integrate major module. The business value dimensions are set according to retrieved information from the company following the principles of Mooney et al. (1996). The new IT platform has impacted business processes of organization in various aspects. The main issue is business process integration. The companies has

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33 Survey by researcher, 2010.
to integrated their global business units in order to manage the organization as one. The new IT platform allows harmonized processes, information transparency, and control.

Therefore, the company may perform more flexibly, formulate quality decisions more rapidly, and serve the customer efficiently throughout the product lifecycle. The IT system permits process and cost efficiency. Business performance is now centrally managed and controlled in a global scale.
5.1 Introduction

5.2 Major Critical Success Factors of ERP Implementation
5.1 Introduction

ERP software automates core functional activities of organizations such as manufacturing, human resource, finance, and supply chain management, by incorporating best practices to facilitate efficient and effective decision-making, cost reductions, and greater managerial control.

These characteristics of ERP make the system integration complex, as consensus is required from the entire enterprise to reengineer a core business process to take advantage of the integrated system. However, there are some factors that are critical for success, often referred as (CSFs), reduce the trouble-shooting, project risk, management support, leadership and identification of system requirements etc. According to Ruben et al. CSFs have been classified in three categories viz. organisational factors, neutral factors and operational factors (Ruben et al., 2005). The results are summarised in figure 5-1:

Table 5-1: Major categories of Critical Success Factors (CSFs)

<table>
<thead>
<tr>
<th>Critical Success Factors for Implementation of ERP system</th>
<th>Organisational Factors</th>
<th>Neutral Factors</th>
<th>Operational Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>● Formalised Project Plan</td>
<td>● Interdepartmental communication</td>
<td>● Management expectations</td>
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<tr>
<td></td>
<td>● Project Management</td>
<td>● Software customization</td>
<td>● Steering committee</td>
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<td></td>
<td>● Cultural Change</td>
<td></td>
<td>● Trust between partners</td>
</tr>
<tr>
<td></td>
<td>● Business Process Reengineering</td>
<td></td>
<td>● Vendor’s tools</td>
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<tr>
<td></td>
<td>● Project champion role</td>
<td></td>
<td>● Managing consultants</td>
</tr>
<tr>
<td></td>
<td>● Interdepartmental communication</td>
<td></td>
<td>● Software configuration</td>
</tr>
<tr>
<td></td>
<td>● Management support and commitment</td>
<td></td>
<td>● Vendor support</td>
</tr>
<tr>
<td></td>
<td>● Monitoring and evaluation process</td>
<td></td>
<td>● Data analysis and conversion</td>
</tr>
<tr>
<td></td>
<td>● Appropriate use of consultant</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>● Training on ERP system</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>● ERP implementation strategy</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>● Clear</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Ruben et al. (2005) Adapted from “Interrelationships of Critical Factors for ERP implementation in SMEs”

1 Ruben Pinedo Cuenca, Dr Ramesh Marasini, Dr Ahmed Abbas, Professor Munir Ahmad (2005), “Interrelationships of Critical Factors for ERP implementation in SMEs”, Flexible Automation and Intelligent Manufacturing, pp.642 – 652.

ERP implementation can reap enormous benefits through successful ERP implementation in companies or it can be disastrous for organizations that fail to manage the implementation process.

Over the past years, Enterprise Resource Planning (ERP) implementation projects success has been a point of research and is one of the main issues in ERP research. Several studies have been published and defined the Critical Success Factors (CSFs) in ERP implementation projects. unified these lists of CSFs and we created a unified model of CSFs in ERP implementation projects (Esteves and Pastor, 2006). I attempted to analyze how a set of CSFs lead to the success of an ERP implementation project and how these CSFs care interrelated between them. We may assume that the different CSFs are interrelated. This assumption is supported by many studies. According to Lechler and Gemünden (2000) "the detailed analysis of interactions among the success factors is necessary and provides information for further inquiry concerning the series of effects that lead to project success or failure". This study is also important for manager predict the success of their ERP implementation projects through the control and monitorization of these CSFs.

In order to model these relationships between CSFs, we explore the possibility of using a statistical approach named Partial Least Squares (PLS). Understanding the critical success factors in implementing Enterprise Resource Planning (ERP) systems has been very critical for successful ERP implementation.

An ERP system enables an organization to integrate all the primary business process in order to enhance efficiency and maintain a competitive position. However, without successful implementation of the system, the projected benefits of improved productivity and competitive advantage would not be forthcoming. Therefore, many researchers for the purpose have been studied. Results of some of the studied reports have mentioned these factors as given ahead.

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Like John Lian, partner and Senior consultant in his paper titled as “A Study Of Prerequisites For Successful ERP Implementations From The Project Management Perspective” based on project management approach he identified fifteen prerequisite elements that can facilitate successful ERP implementations.

These elements are related to specific project management problem areas, using grounded theory coding analysis and constant comparison. Results of the analysis are presented for project managers as a list of recommendations related to project scope, quality, time, cost and expectations.

5.2 Major Critical Success Factors of ERP implementation

Table below presents the widely accepted ‘critical success factors’ as revealed from the literature review, Survey conducted and that are found to be vital for successful ERP implementation:

Table 5-2: Critical Success Factors for successful ERP implementation

<table>
<thead>
<tr>
<th>S.No</th>
<th>Success Factor</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Top management support</td>
<td>Khaled Al-Fawaz et. al (2008)(^5); Al-Mashari et al. (2003)(^6); (Umble et al., 2003)(^7); Zhang et al. (2002); Somer and Nelson, 2001; Sarker and Lee, 2000; Bonerjee, 2000; Gray and Larson, 2000; Vishal Bishnoi (2010)(^8), Survey</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th></th>
<th>Questionnaire</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Business plan and vision</td>
</tr>
<tr>
<td></td>
<td>Khaled Al-Fawaz et. al (2008); Loh and Koh (2004); Somers and Nelson (2004)10, Vishal Bishnoi (2010); Survey Questionnaire</td>
</tr>
<tr>
<td>3</td>
<td>Re-engineering business process</td>
</tr>
<tr>
<td></td>
<td>Davison (2002); Hammer and Champy (2001); Somers and Nelson (2004); Nah (2003); Murray and Coffin (2001), Vishal Bishnoi (2010), Survey Questionnaire</td>
</tr>
<tr>
<td>4</td>
<td>Effective project management and project champion</td>
</tr>
<tr>
<td>5</td>
<td>Teamwork and composition</td>
</tr>
<tr>
<td></td>
<td>Loh and Koh (2004); Al-Mashari et al., (2006); Remus (2006); Nah (2003); Rosario (2000), Vishal Bishnoi (2010); Survey Questionnaire</td>
</tr>
<tr>
<td>6</td>
<td>ERP system selection</td>
</tr>
<tr>
<td></td>
<td>Wei and Wang (2004); Shehab et al., (2004); Everdingen et al. (2000), Vishal Bishnoi (2010), Sprott (2000); Survey Questionnaire</td>
</tr>
</tbody>
</table>


5.2.1. Top Management Support

Top management support refers to the positive commitment, enthusiasm, and support of senior management for ERP project (Shanks et al, 2000)\(^\text{12}\). Top management support has been thought to be the most important factor and confirmed by many western countries and Chinese researchers (Bingi et al, 1999\(^\text{13}\); Parr and Shanks, 2000\(^\text{14}\); Somers and Nelson, 2001\(^\text{15}\); Nah et al, 2001\(^\text{16}\); Akkermans and Helden, 2002\(^\text{17}\); Jiang, 2005\(^\text{18}\); Zhang et al, 2005\(^\text{19}\); Yusuf et al, 2006\(^\text{20}\)).

According to Zhang et al. (2002) top management support in ERP implementation has two main aspects: providing leadership and providing the necessary resources. Additionally, the roles of top management in ERP implementation comprise developing an understanding of the capabilities and limitations, establishing reasonable objectives for


ERP system, exhibiting commitment, and communicating the corporate strategy to all employees (Umble et al., 2003)\textsuperscript{21}. Al-Mashari et al. (2003)\textsuperscript{22} argued that top management support does not end with initiation and facilitation, but must extend to the full implementation of an ERP system. Furthermore, top management support should provide direction to the implementation teams and monitor the progress of the project.

5.2.2. Business Plan and Vision

A clear business plan and vision is needed to guide the project throughout the ERP life cycle (Loh and Koh, 2004)\textsuperscript{23}. The primary stage of any project should begin with a conceptualization of the goals and possible ways to achieve these goals. Additionally, goals should be explained so they are specific and operational, and to indicate the general directions of the project (Somers and Nelson 2004)\textsuperscript{24}.

Nah, F.F.H and Delgado, S (2006)\textsuperscript{25} in their paper stated that one of the biggest problems ERP project leaders face comes not from the implementation itself, but from expectations of board members, senior staff, and other key stakeholders. It is important to set the goals of the project before even seeking top management support. Many ERP implementations have failed as a result of lacking clear plans (Somers and Nelson 2004)\textsuperscript{26}.

5.2.3. Re-engineering of Business Process

Hammer and Champy (2001)\textsuperscript{27} defined Business process re-engineering (BPR) as “the fundamental rethinking and radical redesign of business processes to achieve


\textsuperscript{26} Ibid (Somers and Nelson 2004)

dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service and speed”. Somers and Nelson (2004)\textsuperscript{28} stated that BPR plays a significant role in the early stages of implementation. Furthermore, it is important in the acceptance stage and tends to be less important when the technology becomes routine. Nah, et. al. (2006)\textsuperscript{29} noted that reengineering should continue with new ideas and updates to take full advantage of the ERP system when the system is in use. Organizations should be willing to change their businesses to fit the software in order to reduce the degree of customizations (Murray and Coffin, 2001)\textsuperscript{30}. Many organizations have made unnecessary, complex customizations to ERP software because the people making the changes do not fully understand the organization’s business practices (Nah et. al. 2006)\textsuperscript{31}.

According to Somers and Nelson (2004)\textsuperscript{32} the new business model and reengineering that drives technology choice is an enabling factor that can give to ERP success. Furthermore, Davison (2002)\textsuperscript{33} argued that ERP implementation often requires changes in job descriptions and essential skills.

\subsection*{5.2.4. Effective Project Management}

ERP systems implementation is a set of complex activities thus organizations should have an effective project management strategy to control the implementation process (Zhang \textit{et al.}, 2002)\textsuperscript{34}. Whether the implementation involves a stand-alone software solution or is part of a large project, one methodology that can be suggested for successful implementation includes eight distinct phases. Each phase has definite

\begin{itemize}
\item \textsuperscript{28}\textit{Ibid (Somers and Nelson 2004)}
\item \textsuperscript{31}\textit{Ibid (Nah et. al. 2006)}
\item \textsuperscript{32}\textit{Ibid (Somers and Nelson 2004)}
\item \textsuperscript{34}\textit{Ibid (Zhang \textit{et al.}, 2002)}
\end{itemize}
deliverables that must have management support and project steering committee buy-in before the next phase can begin (Vishal Bishnoi, 2005)\textsuperscript{35}.

Project planning and control is a function of the project’s characteristics such as project size, experiences with the technology, and project structure (Somers and Nelson, 2004)\textsuperscript{36}. Remus (2006)\textsuperscript{37} noted that project champion is one of the most important factors in the implementation of ERP systems. Project champions should own the role of change champion for the life of the project and understand the technology as well as the business and organizational context. Furthermore, project champion must attempt to manage resistance towards positive change in the old system (Loh and Koh, 2004)\textsuperscript{38}.

\section*{5.2.5. Teamwork and Composition}

The ERP team should involve of the best people in the organization (Loh and Koh 2004)\textsuperscript{39}. Al-Mashari \textit{et al.}, (2006)\textsuperscript{40} the success of projects is related to the knowledge, skills, abilities, and experiences of the project manager as well as the selection of the right team members. Also, team should not only be technologically competent but also understand the company and its business requirements (Remus 2006)\textsuperscript{41}.

An ERP project involves all of the functional departments in an enterprise. It demands the effort and cooperation of technical and business experts as well as end-users (Loh and Koh 2004)\textsuperscript{42}. Both business experts and technical knowledge are important for success (Nah 2003)\textsuperscript{43}. The sharing of information between the implementation partners is essential and requires partnership trust (Loh and Koh 2004). Moreover, the team should be familiar with the business functions and products so that they know what needs to be improved to the current system (Rosario 2000)\textsuperscript{44}.

\textsuperscript{36} Ibid (Somers and Nelson, 2004)
\textsuperscript{37} Ibid Remus (2006)
\textsuperscript{38} Ibid Loh and Koh (2004)
\textsuperscript{39} Ibid (Loh and Koh 2004)
\textsuperscript{40} Ibid Al-Mashari \textit{et al.} (2006)
\textsuperscript{41} Ibid Remus 2006
\textsuperscript{42} Ibid
\textsuperscript{43} Ibid
5.2.6. Selecting the Enterprise Resource Planning software

Selection of a suitable Enterprise Resource Planning system is a challenging and time-consuming process. Wei and Wang (2004)\(^{45}\) stated that there is no one single Enterprise Resource Planning package that could provide all the functionalities required for the business. There are various Enterprise Resource Planning packages in the market with similar functionality but different designs including, SAP, Oracle, JD Edwards and Baan (Shehab \textit{et al.}, 2004)\(^{46}\).

Therefore, an organization must select an appropriate vendor that able to provide a flexible Enterprise Resource Planning system. Various authors identified important criteria that need to be taken into account when selecting a new Enterprise Resource Planning system. A study by Everdingen \textit{et al.} (2000)\(^{47}\) stressed that the Enterprise Resource Planning system selected has to closely fit with most of the current business procedures. Additionally, the system has to be flexible, user-friendly and easy to implement. Another similar research study by Sprott (2000)\(^{48}\) reported that applicability, integration, adaptability and upgradeability are essential factors that have to be considered in ERP adoption.

5.2.7. User Involvement

User involvement is one of the most cited critical success factors in ERP implementation projects. User involvement increase user satisfaction and acceptance by developing realistic expectations about system capabilities (Esteves \textit{et al.}, 2003)\(^{49}\). User involvement is essential because it improves perceived control through participating the whole project plan. According to Zhang et al (2002) there are two areas for user involvement when the company decides to implement an ERP system: user involvement

in the stage of definition of the organization’s ERP system needs, and user participates in the implementation of ERP systems.

**5.2.8 Education and Training**

Educating and training users to use ERP is important because ERP is not easy to use even with good IT skills (Woo 2007). Nah et al., (2003) argued that sufficient training can assist increase success for ERP systems. However, lack of training may lead to failure. According to Zhang et al. (2002) the main reason for education and training is to increase the expertise and knowledge level of the users within the company.

**5.2.9 Teamwork and Composition**

ERP teamwork and composition is another very important factor for ERP implementation project. An ERP project involves all of the functional departments and demands the effort and cooperation of technical and business experts as well as end-users of the system. The team should be balanced to accommodate cross functional requirements and should comprise as a mix of internal staffs and external experts. The internal staff can learn the necessary knowledge and skills for ERP system from external consultants (Bhatti, 2005)\(^5\). ERP teamwork and composition has been considered as one of the important factors and discussed by different researchers (Shanks et al, 2000; Nah et al, 2001; Umble et al, 2003; Somers and Nelson, 2001 and 2004; Nah and Delgado, 2006). Especially, Nah et al (2001) have ranked this factor as the No.1 position among their CSFs list.

**5.2.10 Effective Change management**

Change management refers to the management and communication strategies used to ensure that a complex change like ERP that integrates a new big information system, gets the right results, in the right timeframe, at the right costs with minimum

resistance to change. The change management approach will ensure the acceptance and readiness of the new system, allowing the organization to get more benefits from using. (EstevesSousa and PastorCollado, 2000). Change management has been studied as one of the important factors by researchers (Shanks et al, 2000; Nah et al, 2001; Umble et al, 2003; Somers and Nelson, 2001 and 2004; Nah and Delgado, 2006).

This chapter has studied various factors that affect the implementation of ERP software. We have found ten major critical success factors that make an ERP implementation successful.
Chapter 6
EFFECTS OF ERP SOFTWARE IMPLEMENTATION:
CASE ANALYSIS

6.1 ERP Implementation in Indian MNCs
6.2 Case Analysis of ERP Implementation in selected Indian MNCs
6.3 Major Costs in ERP Implementation
6.4 Major Benefits of ERP Implementation
6.1 ERP Implementation in Indian Multinationals

Major Enterprise Resource Planning software implementation projects in Indian multinational organisations have been studied to identify and test the various costs and benefits of ERP implementation and to understand the effect of its implementation in the Indian multinational organisations. Major Indian multinational organisations have been selected for detailed analysis on major economic parameters to test the established hypotheses and to identify their impact of the various operational costs.

6.1.1 ERP implementation at Bharat Petroleum Corporation Limited (BPCL)\(^1\)

In 1951, the Government of India entered into an agreement with UK-based Burmah Oil Company and Shell Petroleum Co. (Burmah-Shell) for establishing an oil refinery in Bombay. In 1952, this agreement led to the incorporation of Burmah Shell Oil Refineries Ltd. (Official website of Bharat Petroleum Corporation Limited)\(^2\)

The BPCL has been showing a continuous increase in its production capacity since financial year 2005 till 2010 that is from 21.62 million metric tones in 2005 to 27.70 million metric tones in 2010. However, due to crude oil price and market volatility the sales turnover and profit after tax were not steady, the graphs given below shows these trends for better understanding:

![Figure 6-1: Sales Turnover at BPCL](image)

Source: Adapted from Annual Report (2009-10), BPCL


\(^2\) ibid
Bharat Petroleum Corporation Limited (BPCL), a leading player in the Indian petroleum industry, successfully implemented an Enterprise Resource Planning (ERP) in November 2001. In fact, the process in April 2000 after the company decided to integrate all its activities through the ERP package SAP R/3. Bharat Petroleum has always been on the forefront of harnessing technology initiatives for BPCL has been on forefront in harnessing technology, maximising efficiency and achieving greater customer satisfaction (ICMR, India, 2010)\(^3\).

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Bharat Petroleum is the first Public Sector Oil Company to implement Enterprise Resource Planning (ERP) solutions. The implementation project popularly known as ENTRANS (Enterprise-wide Transformation) has been awarded the 'SAP Star Implementation Award', with Bharat Petroleum having the distinction of executing the largest and the most ambitious SAP project in India. The challenge of SAP implementation was to ensure that all the integrated elements (of the complex multi-modular integrated solutions that impact the entire workflow of the organisation) work seamlessly across the length and breadth of the country, including the remote locations. Providing online connectivity in these remote locations, given the full-fledged IT network infrastructure, was in itself a daunting task.

Bharat Petroleum claim reaping the benefits of the integrated system in many areas of its operations. The early gains of implementation are in the areas of tracking customer-receivables, monitoring credit-management, inventory management, besides easing the operations in a large number of areas. Furthermore, Bharat Petroleum has also set up one of the biggest 'Centres of Excellence' in Asia to provide online support to the end users and also work towards continuous improvement in business processes and handle product upgrades and new generation products.

With SAP as the IT backbone, Bharat Petroleum plans to take advantage of the Internet based capabilities along the entire value chain with a Customer Relationship Management solution. A large data warehouse project has also been implemented, which facilitates access to real-time accurate information on key performance indicators at all Bharat Petroleum locations. This enables the management to take strategic and business decisions, thus ensuring value-added services, better customer satisfaction and enhanced shareholder value (Courtesy: Official website of Bharat Petroleum)\(^4\).

BPCL divided its IT initiatives into a three-pronged strategy, wherein it planned to create a communication network within the organization. To create a basic information network for the entire corporation and to process transactions with customers all over the

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country. The strategy was devised after the company divided the organization into six SBUs and conducted a detailed evaluation of the company as a whole.

The organization was restructured to help focus on specific customer segments and address their individual needs, the first of which was to allow Industrial and Commercial (I&C) customers to track the status of their orders online. This not only allowed the company to retain existing customers, but also helped in attracting new customers. According to company sources, BPCL's biggest advantage from the ERP implementation was regarding the management of inventory. Before ERP implementation, the company's practice of monthly inventory reviews frequently led to long lead time in processing orders. The company chose Microsoft Exchange Server as the platform, because of the level of integration with the desktop environment and MS Windows NT Server.

BPCL conducted feasibility testing of the solution with the help of a pilot implementation. With the help of Windows NT Server and Exchange Server, BPCL connected three locations on a Very Small Aperture Terminal (VSAT)-based network. For a comprehensive implementation of the intranet, BPCL took help from Microsoft Consulting Services.

BPCL connected its corporate office in Mumbai with the various regional offices. Seven web servers were deployed at the VSAT hub in Bangalore to provide intranet connectivity to users all over the country. Access was provided with the latest local and international developments through the intranet. This not only helped the company offer better services, but also aided in building employee skills and competencies. Internet gateways were made available at the refinery as well as at all the regional offices. All the employees were thus constantly connected to each other and to the outside world.

BPCL implemented various applications to facilitate information retrieval from corporate databases, including intranet applications that allowed employees to access and update personnel records such as contact details and salary information on the intranet itself. It also introduced 'Query by Mail' (QBM) by way of which remote users could
extract business transactions from corporate databases. This system helped conserve the WAN bandwidth and schedule database queries at night. Communication costs reduced drastically because of the communication infrastructure. According to reports, in 1999, savings on long-distance landline communications were less by 30% as compared to costs in 1998.

The ERP implementation was part of the company's 'Project CUSEC (Customer Service and Satisfaction), which had to meet the challenge of an imbalance between refining and marketing. The company selected SAP R/3 as it was already being successfully used by major oil companies in the world. It was also the only package which had an oil industry specific package and an India specific package.

BPCL appointed consultants Coopers and Lybrand for the planning process of SAP R/3's implementation. The consultants worked in close co-ordination with functional experts within the company. The first phase of the implementation began in April 2000. The company's existing network was redesigned and restructured and all its branches were linked to a central connectivity cloud.

SAP R/3 helped BPCL to successfully launch its e-biz initiatives, the first of which was to allow IandC customers to track the status of their orders online. This not only allowed the company to retain existing customers, but also helped in attracting new customers. According to company sources, BPCL's biggest advantage from the ERP implementation was regarding the management of inventory. Before ERP implementation, the company's practice of monthly inventory reviews frequently led to time lag in processing orders. However, after ERP, this problem was eradicated. It was now possible for the company to know the details of receivable of inventories, which in turn made cash management also easier. The company expected the ERP to achieve a payback by 2003.

The introduction of the Petrocard in 1999-00 tested the coordination between the various departments to the fullest. The Petrocard was a 4K-microprocessor smart card, which was used at retail outlets across the country. By March 2001, around 2.5 lakh
customers were using Petrocard with over 20,000 daily transactions taking place at BPCL's retail outlets throughout the country. Petrocard's success put all doubts about BPCL's ERP implementation to rest. After this, BPCL also introduced a Fleet card for transport companies, which made it easier for them to track the position of their inventory. The company also integrated the manufacturing execution system of its refinery with the system.

The success of Petrocard and Fleet cards encouraged the BPCL. British Petroleum planned to introduce an online payment system for making payments of these credit cards. According Mr. Ashok Sinha, Director Finance of BPCL "The basic idea is to translate operations, which have been considered as 'Business to Business' into 'Business to Customer'". The system will be integrated at depots with the help of SAP. We plan more retail disbursements through SAP once RBI's payment disbursement norms are passed." Before the successful implementation of SAP R/3 at BPCL, the ERP market had been proclaimed dead by many analysts because of the number of failures of ERP implementation exercises.

6.1.2 ERP implementation at TATA STEEL

Tata Steel has a balanced global presence in over 50 developed European and fast growing Asian markets, with manufacturing units in 26 countries. It was the vision of the founder; Jamsetji Nusserwanji Tata., that on 27th February, 1908, the first stake was driven into the soil of Sakchi. His vision helped Tata Steel overcome several periods of adversity and strive to improve against all odds. The sales and production values of Steel at TATA steels in recent years is given below:

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Tata Steel’s Jamshedpur (India) Works has a crude steel production capacity of 6.8 MTPA which is slated to increase to 10 MTPA by 2010. The Company also has proposed three Greenfield steel projects in the states of Jharkhand, Orissa and Chhattisgarh in India with additional capacity of 23 MTPA and a Greenfield project in Vietnam.

Through investments in Corus, Millennium Steel (renamed Tata Steel Thailand) and NatSteel Holdings, Singapore, Tata Steel has created a manufacturing and marketing network in Europe, South East Asia and the pacific-rim countries. Corus, which manufactured over 20 MTPA of steel in 2008, has operations in the UK, the Netherlands, Germany, France, Norway and Belgium.

Tata Steel Thailand is the largest producer of long steel products in Thailand, with a manufacturing capacity of 1.7 MTPA. Tata Steel has proposed a 0.5 MTPA mini blast furnace project in Thailand. NatSteel Holdings produces about 2 MTPA of steel products across its regional operations in seven countries.

Tata Steel, through its joint venture with Tata BlueScope Steel Limited, has also entered the steel building and construction applications market. The iron ore mines and collieries in India give the Company a distinct advantage in raw material sourcing. Tata Steel is also striving towards raw materials security through joint ventures in Thailand, Australia, Mozambique, Ivory Coast (West Africa) and Oman. Tata Steel has signed an
agreement with Steel Authority of India Limited to establish a 50:50 joint venture company for coal mining in India. Also, Tata Steel has bought 19.9% stake in New Millennium Capital Corporation, Canada for iron ore mining.

Exploration of opportunities in titanium dioxide business in Tamil Nadu, ferrochrome plant in South Africa and setting up of a deep-sea port in coastal Orissa are integral to the Growth and Globalization objective of Tata Steel. Tata Steel’s vision is to be the global steel industry benchmark for **Value Creation and Corporate Citizenship.** Tata Steel India is the first integrated steel company in the world, outside Japan, to be awarded the **Deming Application Prize 2008** for excellence in Total Quality Management.

The management at Tata Steel wanted the software to seamlessly integrate with its existing information system and further provide compatibility with its future implementations. After an in-depth study of functionality, cost, time, compatibility, esteem, operability, support and future organizational requirements was done, SAP topped the list of contenders.

The implementation of SAP software was associated with certain strategic goals in mind. With this implementation, TATA STEEL wanted to bring forth a culture of continuous learning and change. This would enable TATA STEEL to achieve a world-class status for its products and services and strengthen its leadership position in the industry. Besides this, TATA STEEL also wanted the software to result in quick decision-making, transparency and credibility of data and improve responsiveness to customers across all areas.

The path was set to achieve success through SAP. All the branches, which had huge numbers of transactions and complexity, were identified as a HUB while the smaller branches along with the consignment agents were defined as SPOKES which were attached to these branches. In January 1999 the team from TATA STEEL was decided and christened 'TEAM ASSET' an acronym for Achieve Success through SAP Enabled
Transformation. The success in various modules’ implementation was assured by a phased implementation plan as given below:

(a) Phase I - To Extend SAP in Works with FI, CO, MM, PP and QM
(b) Phase II - To implement SAP modules such as Asset Management and Budget management sub-modules of FICO, Plant maintenance, Human Resources, Production Optimizer (such as SAP APO)
(c) Phase III - SEM (Strategic Enterprise Management)

Figure 6-5: ERP System architecture at TATA STEEL

6.1.3 ERP implementation at Indian Oil Corporation (IOC)

Indian Oil Corporation is India’s flagship national oil company, the highest ranked Indian corporate in the prestigious Fortune ‘Global 500’ listing and also awarded the status of ‘Maharatan’ by the Government of India in 2009-10\(^6\). Company has got over 34,000 workforce, Indian Oil has been helping to meet India’s energy demands for over half a century. Indian Oil in the year 2009-10 had a sales turnover of Rs. 271,074

\(^6\) Indian Oil annual report 2008-09
croc and profits of Rs. 10,221 crore. From the annual report (2009-10) of the IOC, last three financial years, important financial figures i.e Annual Turnover and Profit After Tax of the company are given as below:

**Figure 6-6: Annual Turnover, Indian Oil Corporation**

<table>
<thead>
<tr>
<th>Financial Years</th>
<th>Annual Turnover (Cr. Rs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007-08</td>
<td>247,457</td>
</tr>
<tr>
<td>2008-09</td>
<td>285,398</td>
</tr>
<tr>
<td>2009-2010</td>
<td>271,074</td>
</tr>
</tbody>
</table>

**Figure 6-7: Profit After Tax, Annual Turnover, Indian Oil Corporation**

<table>
<thead>
<tr>
<th>Financial Years</th>
<th>Profit After Tax (Rs. Cr.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007-08</td>
<td>6,963</td>
</tr>
<tr>
<td>2008-09</td>
<td>2,950</td>
</tr>
<tr>
<td>2009-2010</td>
<td>10,221</td>
</tr>
</tbody>
</table>

*Source: Adapted from Annual Report (2009-10), Indian Oil Corporation*

The company’s operations are strategically structured along various business verticals viz. Refineries, Pipelines, Marketing, RandD and Business Development. To achieve the next level of growth, Indian Oil is currently forging ahead on a well laid-out road map through vertical integration upstream into oil exploration and production (EandP) and downstream into petrochemicals – and diversification into natural gas marketing and alternative energy, besides globalisation of its downstream operations.

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7 Indian Oil annual report 2009-10
Having set up subsidiaries in Sri Lanka, Mauritius and the United Arab Emirates (UAE), Indian Oil is simultaneously scouting for new business opportunities in the energy markets of Asia and Africa.

Indian Oil and its subsidiary account for over 48% petroleum products market share, 34.8% national refining capacity and 71% downstream sector pipelines capacity in India. The Indian Oil Group of companies owns and operates 10 of India's 20 refineries with a combined refining capacity of 65.7 million metric tonnes per annum (MMTPA, i.e. 1.30 million barrels per day approx.). Indian Oil’s cross-country network of crude oil and product pipelines, spanning 10,899 km and the largest in the country, meets the vital energy needs of the consumers in an efficient, economical and environment-friendly manner. In 1996 the Company felt a need for a consolidated IT system as it observed that over the years several need based modules were developed that lead to creation of islands of information which lacked integration across the Company.

**Enterprise Resource Planning software Implementation**

For the implementation of ERP system at IOC, the Company appointed M/s Price Waterhouse Associates (PWA) (April 1997) after limited tendering as Consultants for its IT re-engineering project which IOC named ‘Manthan’. The scope of the project broadly included developing a corporate IT strategy, formulation of design parameters for core integration of functional modules to be used at all the units of the Company from Board room to the refineries and upcountry sales offices, then developing the required system architecture, determining the needs for up-gradation and addition of hardware and software, integrating the existing modules as well as new modules and standardisation and implementation of the integrated system across the Company.

The project was to be carried out in four stages, namely, Conceptualization and Design, Development and debugging, Trial Implementation and Stabilisation and Standardisation. The project was proposed to be completed in 29 months (i.e. September 1999).
According to the advice of the Consultants, the Company selected SAP/R3 along with the associated oil and gas specific software IS-OIL and CIN as the ERP solution across the Company. The system was supposed to be integrating important organizational functions such as Finance and Controlling, Human Resources, Production Planning, Sale and Distribution, Material Management, Plant Maintenance, Project System and Quality Management. This was also to be supplemented with ‘add-ons’ i.e. additional software solutions, which could be seamlessly integrated into the ERP environment. The ‘add-ons’ addressed vital functions such as demand forecasting, distribution planning, crude selection and refinery planning.

After a preliminary study and collection of background information an entry conference was held with the Management on 6 March 2007 to discuss the audit objectives/ sub-objectives and audit criteria. Test audit was conducted during February to July 2007 covering the Refinery Offices at Haldia and New Delhi.

In spite of number efforts, the audit report has exhibited that the Company failed to calculate and allocate Rs.20.32 crore towards the manpower cost who were deployed from various divisions towards implementation of the IT re-engineering initiative. The Company also did not effectively communicate roadmap for the implementation of IT project to all levels of the organisation. The audit report identified that IOC had not been able to provide adequate training to all users for operating in the new technological environment.

The Company did not appreciate the possible risks of not keeping the off-site data back up at site(s) other than their Primary Data Centre before they went live on system. Instances of breakdown of leased links interrupting the business transactions occurred at sites, which were not put on the three tiers Communication Network. The company also committed a mistake by keeping Primary Disaster Recovery Centre within the same premises as of Primary Data Centre that would have exposed to the same immediate risks.

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8 SAP is Systeme, Anwendungen, Produkte in der Datenverarbeitung which, translated into English, means Systems, Applications, Products in data processing.
9 Review report on IT audit, Report No. 6 of 2005 (Commercial), Indian Oil Corporation.
of physical disaster. Site selection of Alternate Disaster Recovery Centre also did not take into account many of the threats to the centre.

The audit report also revealed that due to the non-synchronisation of various phases of project resulted in a delay of over two years from September 2002 to November 2004 in completion of the project. If could have completed all the phases the company could have derived the projected benefits of Rs.358 crore per annum from online integrated business processes and optimisation in Supply Chain Management.

6.1.4 ERP Implementation at Oil and Natural Gas Corporation (ONGC)\textsuperscript{10}

ONGC is the flagship company of India; and with a dedicated team of nearly 40,000 professionals, Rs.602062 million turnover, and Rs.167679 million net profit in financial year 2009-10. Turnover and Net Profit of the Company in recent years is given below for better understanding of company’s financial strength:

![Figure 6-8: Turnover and Net Profit, ONGC](image)

The company has adapted progressive policies in scientific planning, acquisition, utilization, training and motivation of the team. Over 18,000 experienced and technically competent executives mostly scientists and engineers from distinguished Universities / Institutions of India and abroad form the core of the organisation.

The workforce includes geologists, geophysicists, geochemists, drilling engineers, reservoir engineers, petroleum engineers, production engineers, engineering and technical service providers, financial and human resource experts, IT professionals and so on. The

\textsuperscript{10} Interview of Mr. T. Ravindran, DGM (EandT) and Project Manager – ICE, Official website of ONGC \texttt{www.ongcindia.com}, (Accessed in May 2009).
liberalized economic policy, adopted by the Government of India in July 1991, sought to
deregulate and de-license the core sectors (including petroleum sector) with partial
disinvestments of government equity in Public Sector Undertakings and other measures.
As a consequence thereof, ONGC was re-organized as a limited Company under the

After the conversion of business of the erstwhile Oil and Natural Gas Commission
to that of Oil and Natural Gas Corporation Limited in 1993, the Government disinvested
2 per cent of its shares through competitive bidding. Subsequently, ONGC expanded its
equity by another 2 per cent by offering shares to its employees. During March 1999,
ONGC, Indian Oil Corporation (IOC), and Gas Authority of India Limited (GAIL), the
only gas marketing companies agreed to have cross holding in each other's stock. This
paved the way for long-term strategic alliances both for the domestic and overseas
business opportunities in the energy value chain, amongst themselves. Consequent to this
the Government sold off 10 per cent of its share holding in ONGC to IOC and 2.5 per
cent to GAIL. With this, the Government holding in ONGC came down to 84.11 per cent.

In the year 2002-03, after taking over MRPL from the A V Birla Group, ONGC
diversified into the downstream sector. ONGC will soon be entering into the retailing
business. ONGC has also entered the global field through its subsidiary, ONGC Videsh
Ltd. (OVL). ONGC has made major investments in Vietnam, Sakhalin and Sudan and
earned its first hydrocarbon revenue from its investment in Vietnam.

Project ICE (Information Consolidation for Efficiency): ONGC conceived its
most ambitious IT project ‘Information Consolidation for Efficiency’ popularly known
as ICE. The project is aimed at consolidating the IT efforts in the implementation of
Enterprise Resource Planning (ERP) package. The estimated cost for the implementation
of the ICE project was Rs.95 Cr. Project ICE is one of the world’s biggest ERP
(Enterprise Resource Planning) packages, across 400 locations of ONGC. Apart from
being one of the largest in size the world (with around 10,000 end-users spread over all
locations of ONGC), the project was very challenging in terms of complexity also.
According to Mr. T. Ravindran, DGM (E&T), Project Manager “today’s competitive business environment, even the most successful organizations have to be build reliable information systems and the importance of this foundation is not lost on the Oil and Natural Gas Corporation (ONGC)”. Project ICE (Information Consolidation for Efficiency) was initiated in the year 2002 under the Leadership of Shri. A. Kaviraj, Executive Director. The other team members included: Shri K S Jamestin, GM and Shri T Ravindran, DGM.

The main objective of the ICE project is to optimize and standardize the business processes for integrated information availability. The ERP package enabled the availability of information on real time basis and elimination of duplication of activities across business process by capturing data at source point which in turn facilitate decision support, better operation control and efficient cost management. ONGC developed an integrated, flexible and standardized Information Technology architecture for fundamental competitive advantage. The organization re-engineered its business processes to bring all the legacy systems under a common ERP (Enterprise Resource Planning) platform nicknamed as project ICE (Information Consolidation for Efficiency). The vision of the then CandMD Mr. Subir Raha was to have “One organization, one data, one Information, ushered in a new era of organization-wide information sharing, and its use would enhance business efficiency”.

ONGC implemented an enterprise-wide ERP implementation under Project ICE comprising 23 modules of SAP. The implementation work was carried out within a tight schedule of 30 months at more than 500 physical locations across the country. It ranged from mobile survey units at Jwalamukhi in Himachal Pradesh and deep-sea vessels at Bay of Bengal to production installations in far-flung areas of Assam and Drilling rigs in the desert of Rajasthan. The project, initially aimed at serving an estimated 10,000 end-users and currently has 23000 end-users working on the system and using the employee self-service (ESS) functionality under SAMPARC.
The project’s magnitude could be gauged from the fact that it constituted of 150 Project Core Team Members, 60 SAP Consultants, 18000 sq. ft Project Office, 4000 Sq. ft area data center with 22.5 TB storage capacities to be built, involving over 10 agencies with an estimated cost of Rs.1950 million. In terms of scope, the number of end-users and SAP modules, Project ICE is one of the largest ERP implementation projects in Asia. The project kicked-off on January 21, 2002, and was implemented throughout ONGC, within 27 months from concept to completion of organization-wide roll out. Under the guidance and constant monitoring by Dr.A.K.Balyan, Director (HR) and I/C, IT and Infocom the project has already kicked-off overseas with the implementation at ONGC Nile Ganga BV for its operations at Khartoum, Sudan and Amsterdam.

ONGC before the implementation of project ICE monitored its operations on daily, monthly, quarterly and annual basis. These are monitored both at work centres and corporate level. This required comprehensive, exhaustive multi process based data integrated manually with each other. In absence of any integrated online data systems, key executives always had top face time lags between the activity period and data availability, resulting in constraints in logical decision making. This crisis led to creation of an IT landscape that was decentralized, comprising of multiple stand alone systems and packages. Evidently an integrated information system for good governance was missing.

Mr. Ravindran also added that they adopted the world class ERP (Enterprise Resource Planning) package SAP R/3 for implementing Project ICE. SAP is World’s largest and the biggest ERP solution provider. The solution architecture proposed for ONGC by SAP aims to provide a comprehensive IT solution encompassing end-to-end business process requirements to address the expectations of the Business Users in terms of meeting the transaction needs, enabling tactical and strategic decision making based on online information. ONGC used SAP R/3 platform to streamline and integrate its various functions. The data centre of project ICE is located in New Delhi. The Project ICE is based on a Public Private Partnership model for long term contract of 5 years.
Project Ice was implemented at a total cost of Rs.136 crore, which includes the cost of Data Centre Systems also. There was no financial support from external agency like the Oil and Natural Gas Ministry. According to Mr. Ravindran ONGC funds the project through its internal funds only. ONGC has very large business operations with the annual turnover of more than Rs. 32000 crores and operating cost of around Rs. 6000 crores. The process discipline enforced through systems like ICE, have unlocked a huge opportunity for value addition thereby improving the bottom line of the enterprise and wealth creation and economic development of our country.

The main objectives achieved by the Project are:

- a) Optimization and standardization of business processes.
- b) Moving up the Value chain
- c) Higher Productivity
- d) Cost Reduction
- e) Strengthening Efficiencies
- f) Lowering of Inventories
- g) Increasing Customer service and satisfaction

There were five major steps in the implementation of the Project:

- a) Project Preparation (Design for all Business modules for all Stages and phases)
- b) Business Blueprint (Design for all Business modules for all Stages and phases)
- c) Realization (phase wise)
- d) Final Preparation (phase wise)
- e) Go-live and Support (phase wise)

The following are the modules implemented in ONGC:

**Production and Planning (PP):** The primary objective of the PP module is to track planned and actual costs of production processing of Crude Oil, Natural Gas and
VAP. It facilitates real time updating of data, helps in calculating actual and standard costs at any stage in the product cycle, monitors real time production environment with online availability of Information related to Materials and Products, as well as customized report generation for faster decision making.

**Plant Maintenance (PM):** The PM module provides a system for the management and maintenance of technical systems including the cost incurred in the planned and breakdown maintenance. By being integrated with other modules it gives the cost of each maintenance activity. It will also track various audit activities and their follow up actions in ONGC. New feature, like online availability of equipment manuals was invoked through LDM functionality.

**Financial Accounting:** This module Integrates General Ledger, Accounts Payable, Accounts Receivable with all the sub ledgers synchronized with the G/L in an on-line, real-time manner. The existing UFSO (KUBER) is a stand alone module with only FI functions. In ICE FI function is integrated with all the adopted R/3 modules starting from supply to the sales. FI function have been suitably updated and up linked to this integrated system to seamlessly interact with all other modules for comprehensive transaction tracking and reporting facilities in all the areas of Financial Management System.

**Controlling (CO):** Controlling (CO) covers the functionalities of Cost Centre Accounting, Profit Centre Accounting and Product Costing for wide range of Management reporting. Controlling features are integrated to the operational modules such as Sales and Distribution, Material Management, Production Planning, Plant Maintenance, OLM, Project System and Financial Accounting.

**Joint Venture Accounting (JVA):** This module is to cover the Joint Venture activities, starting from Joint operating agreements, Work Programs, Equity equations, Expenditure, Cash Calls, Recovery, Billing and Accounting (as operator and non-operator).
**Sales and Distribution (SD):** SD module comprises of entire Sales and Distribution activities starting from sales agreements to delivery and generation and printing of invoice in integrated sales process for all products of ONGC including scrap and services. It is integrated with financial accounting for account receivable management; material management and production planning for real time stock updating and quality management for 10 quality analysis and reporting. Fully compliant with Indian taxation requirement including VAT, it will generate statutory documents, eg. Excise invoice and sales registers and maintain audit trail of transactions through document flow.

**Project System (PS):** This module encompasses all phases of a project from Project Conceptualization, Budgeting, planning of costs and resources and approval of Estimates to Execution, payment and Completion of the project in an integrated scenario. Many customized developments have been made in PS module for engineering, services, drilling, work over, survey, Dry docking and consultancy/ RandD operations. It enabled the treatment of a project as an Enterprise with links to other functional modules and the project could be analyzed in its entirety.

**Material Management (MM):** This module integrates all transactions and functions necessary for material requirement planning, procurement, inventory management, invoice verification, and material valuation. In addition to handling special stock types for Crude oil and other product materials transported by pipeline, this will monitor stocks and automatically generate purchase order proposals for the purchasing department. Existing IMMS system have been seamlessly updated into this system. Additional feature of mapping Service Contracts and Works has been done in this module.

**Quality Management (QM):** QM module covers inspection of procured material, inspection of in-house products, and generation of Quality certificate for issuing finished products to the Customers. Among many features, Vendor/Material complaints
processing, quality clearance certificate for incoming material and for the products, failure analysis etc. shall be available through this system.

The ABAP (Advanced Business Application Programming): ABAP development team provides support to functional module team pertaining to any new developments, enhancements, feasibility, data migration etc. in the standard SAP R/3 system so as to configure as per ONGC's business process pertaining to MIS reports, strategic decision making reports.

Business Information Warehouse (BW): This module shall generate analytical and strategic reports for Business Analysis and performance tracking including the Corporate Key Performance Indicators. The inputs will come from all finance and logistics SAP modules as well as from non-SAP systems like Excel files also. This would become the single, integrated, MIS System for ONGC. These reports would be available online and on the web. ICE, like any ERP implementation, has components of business process reengineering, optimization of business process, re-definition of role and responsibilities. This necessitated a careful and deliberate strategy of change management. This was achieved through multiple scoping exercises, presentations, discussions and structured training. During the post go live scenarios close rapport was achieved amongst the hand holding team of core team members, SAP consultants and the users, which helped in a smooth transition.

Project Ice is replicated both within India and outside the country as well. Public Sectors like Indian Oil Corporation (IOC), Gas Authority of India Limited (GAIL) and Steel Authority of India Limited also have replicated the ICE model. As mentioned above ONGC operates in 10 different countries across the globe where project ICE was replicated. For instance in Sudan ONGC has implemented this project successfully. “Change Management” is what which has been the USP (Unique Selling Point) of the project ICE to be replicated. Due care has been taken for the Data Centre system to be replicated if need be as per the requirement of the organization. A fully redundant setup with three tier security zones, with no single point of failure has been established. Backup
as well as a geographically separated disaster recovery centre also has been the part of the scheme.

The implementation of the Project has resulted in the following benefits: Optimization and standardization of re-engineered business processes to enable integrated information availability; Availability of single source management information that is accurate and on time to facilitate decision making; Elimination of duplication of activities across business processes by capturing data at source point itself; Facilitate information consolidation at all levels resulting in decentralization of decision making leading to better business governance through the information system; Availability of information at the right time, at the right place, thereby, enhancing managerial effectiveness leading to higher productivity; · Integrating all business applications under single ERP platform; · Improved responsiveness to changing global market scenario by adopting new and improved technology solutions; Improved stakeholder relationship management, providing better services to the society, share holders, partners, Government etc;· Integrated Supply Chain Management, optimization of inventory holding achieving better working capital utilization.

Project ICE went live at Western Offshore on 1st October, 2003, Western Onshore on 1st April, 2004, Southern Onshore on 1st July, 2004, Eastern Region on 1st October, 2004 and Enterprise Wide roll out on 31st December, 2004. The legacy business applications UFSO and IMMS were migrated and integrated on to the common platform under ICE. Acceptance of the system throughout the organization has been very successful. Information on inventory, production of our finished goods, costing of goods and services, operational reports like DPR’s and performance reports etc. are also available online. Transparency was ensured by ready access to information on stock availability, purchase order status, funds utilization etc. This has enabled executives of the regions to get relevant information right at their desktops. Corporate executives can view and identify at any time the productivity from the functional operations and can also identify the reasons for much higher and lower productivity.
Sales and production can also be monitored online with facility to draw profit and loss account and balance sheet sector ally instead of only company level reports. In addition to this, there has been elimination of duplicate and redundant activities in case of reporting chain where there were different levels of reporting consolidation before it could be compiled at corporate level. Now the data entry at source point itself helps in generating standardized reports that are available online.

6.1.5 ERP implementation at Maruti Suzuki India Limited

Maruti Suzuki India Limited has been leading India’s car market for more than a quarter of a century. First established in 1981, the company is now a fully-fledged subsidiary of the Suzuki Motor Corporation. Its principal activities include the manufacture and sale of motor vehicles and spare parts via a 300-strong dealer network scattered across India. The sales turnover of the company was Rs.289585 million and the profit after tax was Rs.24976 million in financial year 2009-10. in spite of world recession in recent years, sales of the company is growing constantly with decent profit after tax as given in the figure below:

![Figure 6-9: Net Sales and PAT, Maruti Suzuki](image)

The year 2002 saw Maruti add finance, leasing, insurance, and pre-owned car businesses to its portfolio, increasing the scale of its operations and prompting a review of its processes and systems.

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Oracle Consulting was engaged to install a number of Oracle E-Business Suite modules and integrate them with Maruti’s existing systems. The eight-month project involved managing up to 50 people, including Maruti staff, Oracle consultants, and employees of third-party organizations. Oracle also assisted Maruti with change management, a critical part of the process to ensure quick user acceptance.

Thorough project management by Oracle Consulting enabled Maruti to go live on the Oracle applications without any interruptions to its business. By standardizing on a single Oracle platform, the company achieved better control of its finance, procurement, and human resources functions. It also gained a more manageable and scalable platform to support its rapidly expanding business.

Prior to employing Oracle, Maruti used a number of home-grown systems to manage its various lines of business. Many of these disparate systems could not talk to each other, requiring staff to enter data multiple times and consolidate information to generate management reports.

The addition of four new business sectors in 2002 created further pressures, requiring constant monitoring and human intervention to keep the system operating across the hundreds of locations Maruti serves within India. To support this growth and improve efficiency, the company decided to revamp its information technology systems to provide end-to-end visibility into the organization.

“We were looking for a flexible, expandable system that was easy to manage,” said Rajesh Uppal, Chief General Manager, Information Technology, Maruti Suzuki India. “This would reduce the complexity of the IT environment and our reliance on certain people to maintain the systems. And because our business is undergoing a period of rapid expansion, it was important to have a system that could scale easily.”

**ERP Implementation**

To minimize the impact of the system change on its business, Maruti decided on a phased migration to Oracle E-Business Suite. As a first step, the company decided to
replace its financial, purchasing, and human resources systems with Oracle Financials, Oracle Procurement, and a range of Oracle Human Resources applications.

Oracle Consulting was selected to supervise the implementation, including determining Maruti’s requirements and developing a project plan, designing the system, deploying the software, managing the various parties involved, and providing post-implementation support. The problem with using multiple systems to manage finances was the lack of control over processes and information quality. Each office followed different workflows, which often meant one division lagged behind another in delivering information. Differing data formats required tedious consolidation, preventing real-time access to critical statistics.

With **Oracle Financials**, Maruti was able to standardize on a single financial management platform (Rajesh Ray, 2010). According to Mr. Uppal, the company achieved tight control over accounts payable and accounts receivable, and gained a comprehensive general ledger that assists in the management of all financial information.

Month-end closing is completed within two days, without the fuss that usually accompanies the task. Year-end closing was also done on time before the end of March. With **Oracle** Consulting, on site to provide support, the whole procedure was completed without a hitch. As the business continues to expand, it is also reassuring to know that the Oracle system can scale to meet the growing needs and can be easily integrated with other applications in the package.

Maruti implemented Oracle’s Purchasing module to manage procurement of capital goods, services, and indirect consumables. Prior to implementing Oracle Purchasing, some subsidiaries had a rudimentary system, while others relied on basic spreadsheets to manage the process. This made it difficult for the organization as a whole to have control over capital and services purchasing, leading to escalating costs and excess inventory.

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With Oracle, Maruti now has a standardized platform to oversee procurement. The company has set up a list of preferred suppliers to cut down on the number of vendors it deals with and ensure it has control over costs. An automated workflow sends purchase orders along the approvals chain and keeps staff in the accounts payable department aware of all procurement activity. While moving to an electronic system was a major change for most staff, Uppal said it was adopted quickly after an intensive period of training.

After implementing a range of Oracle Human Resources applications, Maruti reported better control over HR functions such as recruitment, payroll, compensation management, leave management, competency assessments, and staff development. The details of each employee are stored into a single database, from which HR staff can access a complete personal and work history. If a new position needs to be filled, they can search the database and run reports to determine the best candidate for the job. Staff can also run reports to determine the skill level of various employees, and ensure there are proper training programs in place to advance their knowledge.

Maruti deployed Oracle Self-Service HR to free HR staff from basic duties such as changing staff address details and answering queries about payment details and leave entitlements. Staff are encouraged to update their details and apply for vacation time using the system. Their managers can then approve the request online. “Our HR staff love the system because it has released them from mundane tasks and allowed them to focus their energies on value-adding activities such as performance assessment and staff development,” as told by Mr. Uppal. “This helps us attract and retain high-quality people, a major asset for any organization.”

Maruti has a successful story of Oracle implementations, beginning with the deployment of Oracle Database and Oracle Real Application Clusters as a stable foundation for its nationwide dealer management system. The dealer management system itself was developed using Oracle Fusion Middleware products. When it came to selecting a solution for the ERP system, Maruti again turned to Oracle.

Mr. Uppal explained “We evaluated several packages but found that the open interfaces of Oracle E-Business Suite offered the best integration with our legacy
systems, standardizing on Oracle technology and applications would also lower support costs and ensure easy upgrades in the future.” Maruti had previously used external parties to develop and deploy its Oracle solutions. The company worked directly with the vendor to deploy the ERP system.

Some of the ERP investments benefits as experienced by Maruti are:

(a) 25 percent reduction in design-to-launch time; Additional 15 percent improvement yet to come.

Figure 6-10: Effect on Design-to-Launch time at Maruti Suzuki

(b) Lower prices for five models.
(c) 50 percent reductions in assembly/build issues and ECN time.

Figure 6-11: Effect on Assembly / Issue time

(d) Information management, process management and global collaboration supported by Team center software.
(e) More efficient and innovative design and manufacturing with NX™ software.
(f) Ability to simulate manufacturing processes using Tecnomatix software.
6.1.6 ERP Implementation at TATA Motors\(^{13}\)

TATA Motors became the first company from India’s engineering sector to be listed in the New York Stock Exchange in September 2004. They have several international collaborations and acquisitions including Daewoo of Korea and MarcoPolo of Brazil. Tata Motors and the Fiat Group have recently signed a Memorandum of Understanding to establish an industrial joint venture in India to manufacture passenger vehicles, engines and transmissions for overseas markets.

Tata Motors Limited, India’s largest automobile company with Rs.37,447 crore net income and Rs.2240/- crore profit after tax in 2009-10. TATA Motors is the leader by far in commercial vehicles in each segment, and the second largest in the passenger vehicles market with winning products in the compact, mid-size car and utility vehicle segments. The figure given below represents the Net Income and Profit After Tax of TATA Motors:

![Figure 6-12: Net Income and PAT, TATA Motors](image)

The company is the world’s fifth largest medium and heavy commercial vehicle manufacturer. Established in 1945, Tata Motors’ presence indeed cuts across the length and breadth of India. Close to 4 million Tata vehicles ply on Indian roads, since the first rolled out in 1954. The company’s manufacturing base is spread across Jamshedpur, Pune

and Lucknow, supported by a nation-wide dealership, sales, services and spare parts network comprising over 2,000 touch points.

Their annual turnover last year was Rs. 27,000 crores. The company’s 24,000 employees are guided by the vision to be best in the manner in which they operate, best in the products they deliver, and best in their value system and ethics.

According to Probir Mitra, CIO, Tata Motors, “SAP has a clear superiority in the market. It has a large presence and good support, so we chose the SAP ERP Solution for our company. The results have definitely exceeded our expectations”. They decided to go in for the SAP ERP Solution, which provided them all the answers and much more. The SAP Solution would enable them to improve business continuity by unifying the database and functions across the country into one single entity. It would no longer require any location-specific expertise and thus be much easier to maintain.

**Economic considerations**

Before implementing the SAP ERP Solution, there were several homegrown applications that managed all of the company’s IT requirements. Since they were developed over long periods of time, they were on multiple platforms and hence difficult to merge.

The biggest drawback of the legacy applications was that they were function and location specific and were built on local and individual perception of needs. Common and rationalized processes and practices across all organizational units were not enforced. Therefore, managing functions like HR, sales and finance across three manufacturing units spread across the country and their corporate office was tedious and time-consuming. Integrated functions like materials management and payment processing were separate entities, causing delays in individual transactions. This led to unnecessary increase in overhead costs and duplicated efforts at each unit.

Tata Motors outsources their IT to Tata Technologies, which is their 100% subsidiary company. So Tata Technologies became their implementation partner. SAP
India also organized some consulting or them, which had consultants from both India and abroad. In 1997, when the seed of implementation was sown, the WAN infrastructure in India did not permit a single server implementation. Hence a distributed server implementation was done in stages over a period of two years between 1998 and 2000. The version used was 3.1H. In August 2003, they moved over from SAP 3.1H to SAP 4.6C on a single server platform.

There are 3500 users across the country. Once SAP was implemented, rationalization of several processes was done extensively. Various business processes like materials, finance, logistics, etc. were stripped down to their basic components and a lot of re-engineering had to be done, as all these processes became location-independent. Tata Motors also opted for the standard cost functionality, which was a significant business process change for them.

With the SAP ERP Solution in place, Tata Motors has experienced significant benefits in productivity and cost control. The number of servers as well as the number of different applications run on them has been greatly reduced. The disaster recovery management is being done only for one entity rather than for every application.

Non-value-add activities have been lowered. The implementation of a single SAP instance forced a much required change in the organization. A BPR to achieve uniform processes with business users talking the same language was the outcome. There is a significant reduction in inventories and better control over receivables and other credit control.

A shared services platform has also been created for IT and shared financial services. Currently, they are exploring the possibility of a shared services platform for HR too. There has been a reduction of almost 2 weeks time in financial consolidation. The statutory compliance of quarterly closing of books and audit has been very largely facilitated by SAP. Compliance has thus now become more structured and easier to manage. The speed and granularity of cost data availability is a big improvement. The richness of analytical data using system has provided enormous benefits.
SAP® SRM has provided a seamless integration with vendors. The biggest benefit has been the large unified database for the entire enterprise. “Now anyone across the enterprise can just look in and find out what customers we have, who are our suppliers and vendors, what prices we offer, etc. very easily. It brought a synergy in purchasing by strategically sourcing critical components for the entire organization. This resulted in strategic partnering with vendors with volume discounts,” says Mitra.

6.1.7 ERP Implementation at Indo Rama Synthetics (India) Limited

INDORAMA group was founded in 1976, has grown into a multinational conglomerate with a turnover of about USD 4.5 billion. The group has diverse product portfolio and is also well spread geographically. The group is a global manufacturer of diversified industrial products. The main business lines include Polyester and Intermediates (Fiber, PET Resin, PTA), Spun Yarns, Polyolefin, Textiles, Medical Gloves and Petrochemicals. The Group has manufacturing units in Indonesia, Thailand, Turkey, Sri Lanka, Nigeria, Egypt, Lithuania, UK, USA and India with more than 16,000 employees. It has offices all around the Globe and is exporting its products to more than 90 countries worldwide.

The group is now expanding its manufacturing setup in India and is putting up a state of the art Spandex Yarn manufacturing plant in Baddi, Himachal Pradesh with a capacity of about 6000 MT per annum. Technology has been finalized with an Italian company and Engineering contract has been finalized with a German Company. Execution of the project is to start immediately on a fast track basis, so as to achieve commercial production by 31st March 2010. The project is being implemented under a new company Indo Rama Industries Limited with Corporate and Project office in Mumbai.

Economic considerations

The Rs.1400 crore Indo Rama Synthetics is the first Indian polyester company to implement SAP enterprise resource planning(ERP) software package to link all its

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14 Indian Express Newspapers, Sunday, May 7, 2000
business activities across India. The SAP implementation project named IRIS (Indo Rama Integration Strategy) has been put in place with KPMG as the implementation partners for consulting and facilitation.

The polyester company has spent close to Rs.6 crore in implementing the ERP package. According to the Indo Rama's Sr. vice president, sales and marketing, Mr. Alok Goel, the company estimates saving from ERP system around Rs 6-8 crore in the first year of its operation. An internal team for implementation was formed of key 22-23 users drawn from various functional departments, supported by the information technology department.

The systems, application, products in data processing (SAP) has been developed by SAP-AG of Germany who is considered as one of the best ERP packages in the world. The ERP packaged implemented by Indo-Rama uses the Accelerated SAP (ASAP) implementation technology. Implementation of SAP would help providing better customer satisfaction through cost-effective products and services. It would also help improve customer focus and achieve cost effectiveness in its operations.

The key factors to ERP implementation is centralisation of information across the organisation with data pertaining to procurement, sales, production, finance, distribution etc. that is being updated in a real time manner across all the departments of the organization. As per the VP, The ERP systems also avoid duplication of data and effort and induce greater transparency and a more democratic workplace.

The software package SAP R/3 was initially developed for the chemical industry, but over the years has evolved as a complete business solution incorporating the best business practices in the industry, allowing complete integration of business and data processing activities.

The central server (IBM RS/6000 SP) has been placed at its plant at Butibori. With operating on the AIX operating system and oracle 8.0 data base, the server is capable of supporting the users with high performance capabilities, high availability and
automatic switch over in case of server failure, as reported by Mr. Goel a senior official at Indo-Rama Ltd.

6.2 Analysis of ERP Implementation in Selected Indian Multinationals:

The following section will analyse the various economic aspects of Enterprise Resource Planning software implementation in selected multinational organisations using Cost-Benefit analysis, Test of Significance (‘t’ Test), Net Profit trend to test hypotheses. This will also attempt to identify the areas of major cost reduction, and major tangible / intangible benefits of its implementation.

6.2.1 Analysis of ERP Implementation at Bharat Petroleum Corporation Limited (BPCL)

The company hoped to speed up its decision-making and respond faster to customer needs through ERP. The intention was to show the differentiation in service, retain customers and help increase the business of its Industrial and Commercial (IandC) customers. BPCL also wanted to increase its retail thrust by exploiting IT initiatives to the maximum. The noteworthy aspect was that the company was one of the very few Indian companies to have successfully implemented ERP.

6.2.1.1 Hypotheses Testing

(i) The following Cost-Benefit analysis has been done to check Hypothesis H1 through the various cost-benefit parameters such as Net Annual Benefits, Cost-Benefit Ratio, Payback Period, and Return on Investment.
<table>
<thead>
<tr>
<th>Items</th>
<th>Amount</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(Cr. Rs.)</td>
<td>(Cr. Rs.)</td>
</tr>
<tr>
<td><strong>Cost</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost of ERP (Including software, Additional Hardware, and Implementation cost)(^\text{17})</td>
<td></td>
<td>60</td>
</tr>
<tr>
<td><strong>Benefits per year(^\text{18})</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inventory Management</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lubricant</td>
<td>11.4</td>
<td></td>
</tr>
<tr>
<td>Interest saving on reduced working capital</td>
<td>3.5</td>
<td></td>
</tr>
<tr>
<td>Materials (Marketing)</td>
<td>0.38</td>
<td></td>
</tr>
<tr>
<td>Inv. Management and Disposal of surplus mat. At Refinery</td>
<td>0.48</td>
<td></td>
</tr>
<tr>
<td>Inventory Management at LPG</td>
<td>1.39</td>
<td></td>
</tr>
<tr>
<td><strong>Sub Total</strong></td>
<td></td>
<td>17.15</td>
</tr>
<tr>
<td><strong>Accounting / Finance</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prompt Payment discount on purchase and service</td>
<td>0.11</td>
<td></td>
</tr>
<tr>
<td>Reduction in debit / credit notes</td>
<td>1.80</td>
<td></td>
</tr>
<tr>
<td>Credit Management: Saving in lead time of lodgment bills and better collection</td>
<td>1.54</td>
<td></td>
</tr>
<tr>
<td>Stock Management: Reduction in communication cost incurred in obtaining information</td>
<td>0.75</td>
<td></td>
</tr>
<tr>
<td>Logistics Accounting</td>
<td>0.03</td>
<td></td>
</tr>
<tr>
<td>Sales and stock Accounting (Aviation)</td>
<td>0.12</td>
<td></td>
</tr>
<tr>
<td>Treasury: Cash flow management</td>
<td>4.07</td>
<td></td>
</tr>
<tr>
<td>Corporate Finance: Reduction in reconciliation and costing of accounts</td>
<td>0.28</td>
<td></td>
</tr>
<tr>
<td>Payment of Bills</td>
<td>1.93</td>
<td></td>
</tr>
<tr>
<td>Bulk Purchase Discounts</td>
<td>0.50</td>
<td></td>
</tr>
</tbody>
</table>


\(^\text{18}\) Ibid
<table>
<thead>
<tr>
<th>Cost Category</th>
<th>Benefits (Cr. Rs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Payment to Vendors</td>
<td>0.78</td>
</tr>
<tr>
<td>Increase in Sales Tax set off and savings from shipping and excise</td>
<td>1.00</td>
</tr>
<tr>
<td>Sub Total</td>
<td>12.91</td>
</tr>
<tr>
<td>Human Resource and Operations</td>
<td></td>
</tr>
<tr>
<td>Reduction in repair and other maintenance</td>
<td>0.25</td>
</tr>
<tr>
<td>Reduction in clerical over-time</td>
<td>0.37</td>
</tr>
<tr>
<td>Reduction in communications expenses</td>
<td>3.71</td>
</tr>
<tr>
<td>Quality Management and ISO documentation</td>
<td>0.09</td>
</tr>
<tr>
<td>Shift Management</td>
<td>0.20</td>
</tr>
<tr>
<td>Reduction in staff cost and increase in ROI on funds invested by retirement benefits</td>
<td>0.23</td>
</tr>
<tr>
<td>Reduction in internal mailing</td>
<td>1.95</td>
</tr>
<tr>
<td>Reduction in applications maintenance</td>
<td>0.50</td>
</tr>
<tr>
<td>Reduction in printing reports</td>
<td>0.11</td>
</tr>
<tr>
<td>Tendering, Handelling and Monitoring of projects</td>
<td>2.84</td>
</tr>
<tr>
<td>Reduction in staff cost and administrative cost</td>
<td>0.84</td>
</tr>
<tr>
<td>Reduction of overtime benefits accruing out of elimination of Overtime</td>
<td>0.61</td>
</tr>
<tr>
<td>Sub Total</td>
<td>11.70</td>
</tr>
<tr>
<td>Misc</td>
<td>0.43</td>
</tr>
<tr>
<td>Net Annual Benefits (Cr. Rs.)</td>
<td>42.19</td>
</tr>
<tr>
<td>Cost Benefit Ratio (Present Value of Benefits/ Present Value of Costs)</td>
<td>0.70</td>
</tr>
<tr>
<td>Payback Period (one time cost / annual benefits)</td>
<td>1.42 (Years)</td>
</tr>
<tr>
<td>Return on Investment (Annual benefits/Fixed cost) X 100</td>
<td>70.31%</td>
</tr>
</tbody>
</table>

After conducting the analysis it may be concluded in context of BPCL that the benefits over the costs of implementation are reasonably good as ROI is 70.31% and the cost of investment is expected to be recovered within 1.42 years only. On the basis of these parameter we can say that it is economically beneficial to implement ERP system in BPCL and hence may accept the hypothesis H1.
(ii) Test for the effectiveness of ERP solution

The following test is used to test hypothesis H2 by checking weather the cost of selected operations has reduced significantly after the implementation of ERP software. As the sample size is small we have used the “t test” to check the hypothesis.

Table 6-2: Test of significance (‘t’ test) on selected operations in BPCL

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Pre ERP (Million Rs.)</th>
<th>Post ERP (Million Rs.)</th>
<th>Variance</th>
<th>Sq. Var.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inventory Management</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stores and Spares</td>
<td>590.02</td>
<td>538.57</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inventory</td>
<td>29398.82</td>
<td>26028.87</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sub Total</td>
<td>29988.84</td>
<td>26567.44</td>
<td>3421.40</td>
<td>11705977.96</td>
</tr>
<tr>
<td>Accounting and Finance</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loss on Sale(Net) (Schedule V)</td>
<td>50.99</td>
<td>7.11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sundry Creditors to SSI</td>
<td>163.86</td>
<td>144.53</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sundry debtors</td>
<td>9829.04</td>
<td>8428.52</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sub Total</td>
<td>10043.89</td>
<td>8580.16</td>
<td>1463.73</td>
<td>2142505.51</td>
</tr>
<tr>
<td>Human Resource and Operations</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Packages Consumed</td>
<td>507.93</td>
<td>476.68</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consumption of Spare, Material, and Power</td>
<td>243.13</td>
<td>183.46</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repair and Maintenance</td>
<td>727.8</td>
<td>718.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salary and Wages</td>
<td>4714.12</td>
<td>4514.34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sub Total</td>
<td>6192.98</td>
<td>5892.56</td>
<td>300.42</td>
<td>90252.18</td>
</tr>
<tr>
<td>Sum (Rs Cr.)</td>
<td>46226</td>
<td>41040</td>
<td>5186</td>
<td>13938736</td>
</tr>
<tr>
<td>Mean</td>
<td></td>
<td></td>
<td>1729</td>
<td></td>
</tr>
<tr>
<td>CF</td>
<td></td>
<td></td>
<td>8963309.60</td>
<td></td>
</tr>
<tr>
<td>Sum Sq</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SE</td>
<td></td>
<td></td>
<td>1577.25</td>
<td></td>
</tr>
<tr>
<td>SEM</td>
<td></td>
<td></td>
<td>910.62</td>
<td></td>
</tr>
<tr>
<td>Value of ‘t’</td>
<td></td>
<td></td>
<td>1.90</td>
<td></td>
</tr>
</tbody>
</table>

As given in table 6-2, the calculated value of ‘t’ i.e 1.90 which is higher than the table value of ‘t’ i.e. 1.533 at degree of freedom (n1+n2-2) 4 and degree of error .1, hence
it is proved that there is a significant cost reduction after the implementation of ERP software in the organisation and therefore, the hypothesis H2 is accepted.

6.2.1.2 Other benefits of ERP at BPCL

(a) Impact on Market Share of ERP Implementation: With the successful implementation, BPCL customers could access information and do business online, which enabled BPCL to increase its share of I& C customers from 14.9% in 2000 to 15.8% in 2001. After the ERP implementation, BPCL's revenues grew by 2.28% in 2000-01, even as the revenues of the petroleum industry declined by 3.4%.

![Figure 6-13: Impact on I& C Market Share](image)

- Impact of ERP Implementation on Revenue and Net Margins

Table 6-2: Decadal Impact of ERP Implementation on Revenue and Net Margins of BPCL\(^{19}\)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales/ Income</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>from Operations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Rs. In Cr.)</td>
<td>46852.88</td>
<td>45500.6+</td>
<td>56818.36</td>
<td>62569.32</td>
<td>72036.60</td>
<td>86222.9</td>
<td>10907.93</td>
<td>12317.96</td>
<td>14733.62</td>
<td>13374.91</td>
</tr>
<tr>
<td>Earning before</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tax (Rs. In Cr.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(EBT)</td>
<td>1113.12</td>
<td>1544.83</td>
<td>2956.38</td>
<td>3832.45</td>
<td>2975.39</td>
<td>871.66</td>
<td>3369.53</td>
<td>3020.03</td>
<td>2772.17</td>
<td>1134.57</td>
</tr>
<tr>
<td>Net Margin</td>
<td>2.38</td>
<td>3.40</td>
<td>5.20</td>
<td>6.13</td>
<td>4.13</td>
<td>1.01</td>
<td>3.09</td>
<td>2.45</td>
<td>1.88</td>
<td>0.85</td>
</tr>
</tbody>
</table>

* : Operations on ERP begun completely
+ : The reduction in sales was on account of termination of the marketing arrangements with Chennai Petroleum Corporation Limited (CPCL). Under a marketing agreement signed with CPCL, the Corporation, till last year, was purchasing their entire product and was marketing the same including sales to other oil companies. While termination of this agreement has resulted in reduction of these sales to other oil companies, the same has not affected the profits as the sales were made at purchase value.

\(^{19}\) Annual Reports of Bharat Petroleum Corporation Limited (2001-10)

Source: Annual Reports of BPCL (2001-10)
Benefits in HR Department are as given below:\textsuperscript{20}:

(a) Eliminated the need for 20,000 printed pay slips a month.
(b) Reduced overtime at refineries by 42%.
(c) Enabled employees to receive compensation for personal leave and travel expenses via payroll.
(d) Reduced monthly payroll processing time from 8 days to 3 days.
(e) Gained ability to audit reports, process information, and make retroactive changes.
(f) Implemented process workflow based on HR organizational structure.

Major operational benefits of ERP implementation at BPCL

(a) Reduced cycle times for key business tasks
(b) Increased productivity by implementing centralized payroll
(c) Improved HR operations with intuitive employee self-service
(d) Reduced time for processing payment arrears from 6 months to 10 days.
(e) Replaced printed pay slips with online pay slips
(f) Implemented robust online performance management system

(g) Achieved 90% adoption of new software within less than a month of deployment.

(h) Completed project on time and within budget.

(i) Aligned change management with project implementation.

(j) Improved data quality and integrity

(k) Standardized processes

(l) Reduced training needs due to ease of use.

(m) Developed detailed migration strategy for the legacy data

6.2.2 Analysis of ERP implementation at TATA STEEL\textsuperscript{21}

SAP ERP solutions produced a remarkable result to the company in terms of financial technical and managerial parameters. The effective handling and speed delivery resulted in greater sales. Similarly there was a drastic fall in the amount owned to creditors. The systems were made more user friendly without any complexities and procedural lacunas. This improved the quality of work and lessened the time taken for work and thereby increased the productivity.

"Post the introduction of the ERP solution, the results have been terrific. Tata Steel has spent close to Rs.40 crore on its implementation and has saved Rs.33 crore within a few months, the manpower cost has reduced from over Rs.200 per ton two years ago before ERP implementation, to about Rs.140 per ton in 2000. The overdue outstanding has been brought down from Rs 5,170 million in 1999 before implementation to Rs.4,033 million after ERP implementation. The inventory carrying cost has drastically deflated from Rs.190 per ton to Rs.155 per ton said Ramesh C. Nadrajog, Vice President, Finance, Tata Steels.\textsuperscript{22}

6.2.2.1 Hypothesis Testing

(i) The following Cost-Benefit analysis has been done to check Hypothesis H1 through the various cost-benefit parameters such as Net Annual Benefits, Cost-Benefit Ratio, Payback Period, and Return on Investment.

\textsuperscript{21} "TISCO rolls steel power with SAP technology", Network Magazine- A solution for competitive edge. Web source: http://www.networkmagazineindia.com/200109/case2.htm

Table 6-4: Cost Benefit analysis of ERP Implementation at TATA Steel

<table>
<thead>
<tr>
<th>Items</th>
<th>Amount</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Costs</strong></td>
<td>(Rs in Cr.)</td>
<td>(Rs. In Cr.)</td>
</tr>
<tr>
<td>Cost of ERP (Including software, Additional Hardware, and Implementation cost)</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td><strong>Benefits per year</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Inventory Management</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saving on Inv. Management Cost Rs.35/ ton</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Inventory (2001-02) = (Opening + Closing Stock) / 2 i.e. = (203332+209999)/2</td>
<td>206665.5X35</td>
<td></td>
</tr>
<tr>
<td><strong>Sub Total</strong></td>
<td>0.72</td>
<td></td>
</tr>
<tr>
<td><strong>Accounting / Finance</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overdue Outstanding (reduction in book debts outstanding from 53 days to 50 days i.e from Rs.1138 Cr. To 1073.66 Cr.)</td>
<td></td>
<td>6.44</td>
</tr>
<tr>
<td>Saving of interest on differential amount @10% per year during 2001-2002</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Human Resource and Operations</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saving on manpower cost from Rs.200/ton before ERP to Rs.140 / ton after ERP implementation during 2001-02.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production of saleable Steel 3596000 ton</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manpower cost of @ 200 per ton</td>
<td>719200000</td>
<td></td>
</tr>
<tr>
<td>Manpower cost of @ 140 per ton</td>
<td>503440000</td>
<td></td>
</tr>
<tr>
<td><strong>Saving on deferential</strong></td>
<td>21.58</td>
<td></td>
</tr>
<tr>
<td><strong>Miscellaneous</strong></td>
<td>4.26</td>
<td></td>
</tr>
<tr>
<td><strong>Net Annual Benefits</strong></td>
<td>33</td>
<td></td>
</tr>
<tr>
<td><strong>Cost Benefit Ratio</strong></td>
<td>0.825</td>
<td></td>
</tr>
<tr>
<td><strong>Payback Time</strong></td>
<td>1.21 (Years)</td>
<td></td>
</tr>
<tr>
<td><strong>Return on Investment</strong></td>
<td>82.5%</td>
<td></td>
</tr>
</tbody>
</table>

---

23 Annual Report Tata Steel (2001-02)
24 ibid
25 Annual Report Tata Steels (2001-02)
26 Director’s report attached to Annual account 2001-02
As revealed in the analysis it may be concluded in context of Tata Steels that the benefits over the costs of implementation are reasonably good as ROI is 82.5% and the cost of investment is expected to be recovered within 1.21 years only. On the basis of these parameter we can say that it is economically beneficial to implement ERP system in TATA Steel and hence may accept the hypothesis H1.

(ii) Test of Significance: As the sample size is small we have used the ‘t’ test to check the hypothesis H2.

Table 6-5: Test of significance ('t' Test) on selected operations in TATA Steels

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Pre ERP</th>
<th>Post ERP</th>
<th>Variance</th>
<th>Sq Var.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inventory Management (Cr.)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inventory Cost (Avg. Inv. 284666 Ton)</td>
<td>5.41</td>
<td>4.41</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freight and Handling Charges</td>
<td>578.45</td>
<td>561.74</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stores Consumed</td>
<td>361.79</td>
<td>355.91</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sub Total</strong></td>
<td>945.65</td>
<td>922.06</td>
<td>23.59</td>
<td>556.32</td>
</tr>
<tr>
<td><strong>Accounting and Finance (Cr. Rs.)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reduction in overdue amount</td>
<td>517</td>
<td>403.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sundry Debtors</td>
<td>1380.49</td>
<td>1206.53</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sundry Creditors</td>
<td>1582.96</td>
<td>1511.64</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advance</td>
<td>176.7</td>
<td>169.47</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cash Credit from Banks</td>
<td>415.34</td>
<td>395.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sub Total</strong></td>
<td>4072.49</td>
<td>3686.02</td>
<td>386.47</td>
<td>149359.06</td>
</tr>
<tr>
<td><strong>Human Resource and Operations</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manpower Cost (Based on production)</td>
<td>71.92</td>
<td>50.344</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relining Expenses</td>
<td>55.13</td>
<td>23.07</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conversion Charges</td>
<td>329.28</td>
<td>231.87</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sub Total</strong></td>
<td>456.33</td>
<td>305.284</td>
<td>151.05</td>
<td>22814.89</td>
</tr>
<tr>
<td><strong>Sum (Rs Cr.)</strong></td>
<td>5474</td>
<td>4913</td>
<td>561</td>
<td>172730.27</td>
</tr>
<tr>
<td><strong>Mean</strong></td>
<td>1825</td>
<td>1638</td>
<td>187</td>
<td></td>
</tr>
<tr>
<td>CF</td>
<td></td>
<td></td>
<td></td>
<td>104945.28</td>
</tr>
<tr>
<td>Sum Sq</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SE</td>
<td></td>
<td></td>
<td></td>
<td>184.10</td>
</tr>
<tr>
<td>SEM</td>
<td></td>
<td></td>
<td></td>
<td>106.29</td>
</tr>
<tr>
<td><strong>Value of 't'</strong></td>
<td></td>
<td></td>
<td></td>
<td>1.76</td>
</tr>
</tbody>
</table>

**Conclusion:** As the calculated value of ‘t’ i.e 1.76 which is higher than the table value of ‘t’ i.e. 1.533 at degree of freedom (n1+n2-2) 4 and degree of error .1, hence it is proved that there is a significant cost reduction after the implementation of ERP software in the organisation.

6.2.2.2 Other benefits of ERP at TATA Steel

(a) Impact of ERP Implementation on Revenue and Net margins

Table 6-6 : Decadal Impact of ERP Implementation on Revenue and Net Margin

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sales/Income from Operations (Cr. Rs.)</strong></td>
<td>7759.4</td>
<td>7597.0</td>
<td>9793.2</td>
<td>11920.96</td>
<td>14498.95</td>
<td>15139.39</td>
<td>17551.09</td>
<td>19693.28</td>
<td>24315.77</td>
<td>25021.98</td>
</tr>
<tr>
<td><strong>Earning before Tax (Cr. Rs.)</strong></td>
<td>602.44</td>
<td>251.61</td>
<td>1262.5</td>
<td>2665.96</td>
<td>5297.81</td>
<td>5239.96</td>
<td>6261.75</td>
<td>7066.36</td>
<td>7315.61</td>
<td>7214.30</td>
</tr>
<tr>
<td><strong>Net Margin (%)</strong></td>
<td>7.76</td>
<td>3.30</td>
<td>12.88</td>
<td>22.36</td>
<td>36.54</td>
<td>34.61</td>
<td>35.68</td>
<td>35.88</td>
<td>30.09</td>
<td>28.83</td>
</tr>
</tbody>
</table>

* : Operations on ERP begun  
+ : Less earnings due to sale price reduction as per annual report 2001-02 of Tata Steel  
Source : Annual Reports of TATA Steels

---

27 Respective years annual reports of TATA Steel
There have been significant costs savings through management of resources with the implementation of SAP. With SAP's solution Tata Steel can now update their customers on a daily basis and provide seamless services across the country improving customer management. The availability of online information has facilitated quicker and reliable trend analysis for efficient decision-making. Besides the streamlined business process reduces the levels of legacy system and also provides consistent business practices across locations and excellent audit trail of all transactions.

(a) Reduction in Manpower Cost:

(Source: Adapted from Annual report of TATA Steels, 2001-02)
(b) Savings on Overdue Outstanding

Figure 6-17: Effect on Overdue Outstanding in TATA Steels

![Bar Chart](Image)

(Source: Adapted from Annual report of TATA Steels, 2001-02)

(c) Inventory Carrying Cost

Figure 6-18: Effect of ERP on Inventory Carrying Cost

![Bar Chart](Image)

(Source: Annual report of TATA Steels, 2001-02)

6.2.3 ERP implementation at Indian Oil Corporation (IOC)

The project estimates (including software, hardware and consultancy costs) of Rs.95.95 crore in March 1997 escalated to Rs.273 crore in September 2002, however, Rs.182 crore had been spent on the project (March 2004)\(^\text{28}\).

The Company, while implementing the ERP system, calculated the expected benefit of Rs.358 crore per annum due to implementation of ERP and Rs.215 crore per annum

---

due to implementation of add-ons in ERP\textsuperscript{29}. This benefit was supposed to flow after implementation of the project from

- (i) inventory optimisation (Rs.147 crore),
- (ii) reduction in transportation expenses (Rs.70 crore),
- (iii) saving in banking cash (Rs.33 crore),
- (iv) reduction in demurrage costs (Rs.31 crore),
- (v) discount through accounts payable management (Rs. 30 crore),
- (vi) reduction in cheque holding time (Rs.15 crore),
- (vii) reduction in accounts receivable (Rs.12 crore),
- (viii) reduction in time overrun in project implementation (Rs.11 crore) and
- (ix) Reduction in communication expenses (Rs.9 crore).

The benefits from ‘add-ons’ were expected to flow from crude mix optimisation (Rs.115 crore) and expected to yield improvement in refineries (Rs.100 crore).

\textbf{Figure 6-19: Estimated Cost Reduction / Savings}

![Bar chart showing estimated cost reduction/savings](chart.png)

\textit{Source:} Adapted from “Reviews on IT Audit”, Report No. 6 of 2005 (Commercial), Indian Oil Corporation, p 119.

\textsuperscript{29} Re-engineering Project (Manthan) (2005), “Reviews on IT Audit”, Report No. 6 of 2005 (Commercial), Indian Oil Corporation, Chapter 5, pp 113 – 133.
6.2.3.1 Hypothesis Testing

(i) The following Cost-Benefit analysis has been done to check Hypothesis H1 through the various cost-benefit parameters such as Net Annual Benefits, Cost-Benefit Ratio, Payback Period, and Return on Investment.

(a) Cost-Benefit analysis\(^{30}\) of ERP Implementation at IOC

**Table 6-7: Cost-Benefit Analysis of Indian Oil Corporation (IOC)**

<table>
<thead>
<tr>
<th>Cost Benefit Analysis (IOC)</th>
<th>Amount</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cost</strong></td>
<td>(Cr. Rs.)</td>
<td>(Cr. Rs.)</td>
</tr>
<tr>
<td>Cost of ERP (Including software, Additional Hardware, and Implementation cost)[1]</td>
<td></td>
<td>182</td>
</tr>
<tr>
<td><strong>Benefits per year</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inventory Management</td>
<td>147</td>
<td></td>
</tr>
<tr>
<td>Accounting / Finance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saving in banking cash</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>Discount through accounts payable management</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Reduction in cheque holding time</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Reduction in accounts receivable</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Sub Total</td>
<td>90</td>
<td></td>
</tr>
<tr>
<td><strong>Human Resource and Operations</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reduction in transportation expenses</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td>Reduction in demurrage costs</td>
<td>31</td>
<td></td>
</tr>
<tr>
<td>Reduction in time overrun in project implementation</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Reduction in communication expenses</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Sub Total</td>
<td>121</td>
<td></td>
</tr>
<tr>
<td><strong>Net Annual Benefits</strong></td>
<td>358</td>
<td></td>
</tr>
<tr>
<td><strong>Payback Period (one time cost / annual benefits)</strong></td>
<td>182/358</td>
<td>0.51</td>
</tr>
<tr>
<td><strong>Cost Benefit Ration</strong></td>
<td>0.51</td>
<td></td>
</tr>
<tr>
<td><strong>Return on Investment (Annual benefits/Fixed cost) X 100</strong></td>
<td>(182/358)x 100</td>
<td>50.84</td>
</tr>
</tbody>
</table>


\(^{30}\) Ibid (Audit Report on Manthan Project)
According to the analysis it may be concluded in context of Indian Oil Corporation (IOC) that the benefits over the costs of implementation are reasonably good as ROI is 50.84% and the cost of investment is expected to be recovered within 1 year only. On the basis of these parameter we can say that it is economically beneficial to implement ERP system in TATA Steel and hence may accept the hypothesis H1.

(ii) Impact of ERP system on selected operations:
The following test is used to test whether the cost of selected operations has reduced significantly after the implementation of ERP software. As the sample size is small we have used the ‘t’ test to check the statement.

Table 6-8: Test of significance (‘t’ test) on major cost variables at Indian Oil Corporation

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Pre ERP (Cr. Rs.)</th>
<th>Post ERP (Cr. Rs.)</th>
<th>Variance</th>
<th>Sq of variance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inventory Management</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inventory Cost</td>
<td>19839.9</td>
<td>19692.96</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freight, Transportation charges and Demurrage</td>
<td>4288.22</td>
<td>4114.87</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sub Total</td>
<td>24128.18</td>
<td>23807.83</td>
<td>320.35</td>
<td>102624.12</td>
</tr>
<tr>
<td><strong>Accounting and Finance</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bad debts / Advances and Claims written off</td>
<td>3.94</td>
<td>2.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loan and Advances</td>
<td>6045.79</td>
<td>4730.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total dues of SSI undertakings</td>
<td>44.31</td>
<td>35.23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outstanding Receivables</td>
<td>14.9</td>
<td>6.46</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outstanding Payables</td>
<td>114.24</td>
<td>58.86</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loss on Assets sold, Advance Claims written off</td>
<td>23.96</td>
<td>15.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sub Total</td>
<td>6247.14</td>
<td>4849.05</td>
<td>1398.09</td>
<td>1954655.65</td>
</tr>
<tr>
<td><strong>Human Resource and Operations</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintenance Plant and</td>
<td>526.72</td>
<td>518.17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Machines</td>
<td>3105.19</td>
<td>2437.98</td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>---------</td>
<td>---------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost of Production (Overall)</td>
<td>18.36</td>
<td>16.91</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Processing Fees, Blending Fee etc.</td>
<td>42.22</td>
<td>10.88</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturing, Admin and other Exp.</td>
<td>702.73</td>
<td>633.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Handling Exp. To parties related to Joint Venture Companies</td>
<td>41.4</td>
<td>33.51</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sub Total</td>
<td>14971.98</td>
<td>12614.46</td>
<td>2357.52</td>
<td>5557900.55</td>
</tr>
<tr>
<td>Sum (Rs Cr.)</td>
<td>4076</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>1359</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CF</td>
<td>5537816.64</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sum Sq</td>
<td>7615180.32</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SE</td>
<td>1019.16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SEM</td>
<td>588.41</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Value of 't'</td>
<td>2.31</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Annual report of 2004-05 and 2005-06 of IOC.

**Conclusion:** As the calculated value of ‘t’ i.e 2.31 which is higher than the table value of ‘t’ i.e. 1.533 at degree of freedom (n1+n2-2) 4 and degree of error .1, hence it is proved that there is a significant cost reduction after the implementation of ERP software in the organisation.
6.2.3.2 Effect on Production Cost

Table 6-9: Calculation of Production Cost at Indian Oil Corporation

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Product Name</th>
<th>FY</th>
<th>Sales</th>
<th>Opening</th>
<th>Closing</th>
<th>Diff</th>
<th>Total Production</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Stock</td>
<td>Stock</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2006</td>
<td>2005</td>
<td>2007</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Petroleum Products (MMT)</td>
<td>06</td>
<td>618.3</td>
<td>44.01</td>
<td>46.32</td>
<td>2.31</td>
<td>620.64</td>
</tr>
<tr>
<td></td>
<td></td>
<td>05</td>
<td>638.2</td>
<td>49.26</td>
<td>44.01</td>
<td>-</td>
<td>633</td>
</tr>
<tr>
<td>2</td>
<td>Lubricant and greases (MMT)</td>
<td>06</td>
<td>4.19</td>
<td>0.43</td>
<td>0.44</td>
<td>0.01</td>
<td>4.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>05</td>
<td>3.71</td>
<td>0.52</td>
<td>0.43</td>
<td>-</td>
<td>3.62</td>
</tr>
<tr>
<td>3</td>
<td>Crude Oil (MMT)</td>
<td>06</td>
<td>89.16</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>89.16</td>
</tr>
<tr>
<td></td>
<td></td>
<td>05</td>
<td>74.73</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>74.73</td>
</tr>
<tr>
<td>4</td>
<td>Base Oil and Additives (MMT)</td>
<td>06</td>
<td>0.64</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.64</td>
</tr>
<tr>
<td></td>
<td></td>
<td>05</td>
<td>0.77</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.77</td>
</tr>
<tr>
<td>5</td>
<td>Lab (MMT)</td>
<td>06</td>
<td>1.07</td>
<td>0.06</td>
<td>0.1</td>
<td>0.04</td>
<td>1.11</td>
</tr>
<tr>
<td></td>
<td></td>
<td>05</td>
<td>0.4</td>
<td>0</td>
<td>0.06</td>
<td>0.06</td>
<td>0.46</td>
</tr>
<tr>
<td></td>
<td>Sub Totol</td>
<td>07</td>
<td>757.8</td>
<td>1</td>
<td>47.64</td>
<td>50.48</td>
<td>2.84</td>
</tr>
<tr>
<td>6</td>
<td>Gas</td>
<td>06</td>
<td>670.8</td>
<td>6.1</td>
<td>0.52</td>
<td>5.58</td>
<td>665.22</td>
</tr>
<tr>
<td></td>
<td></td>
<td>05</td>
<td>628.4</td>
<td>7.28</td>
<td>6.1</td>
<td>1.18</td>
<td>627.27</td>
</tr>
<tr>
<td></td>
<td></td>
<td>07</td>
<td>771.1</td>
<td>0.53</td>
<td>1.58</td>
<td>1.05</td>
<td>772.19</td>
</tr>
<tr>
<td>--------------------------</td>
<td>---------</td>
<td>---------</td>
<td>---------</td>
<td>---------</td>
<td>----------</td>
<td>---------</td>
<td></td>
</tr>
<tr>
<td><em><em>Total Prod. (in MMTon</em>)</em>*</td>
<td>1380.97</td>
<td>1339.85</td>
<td>1532.84</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Expend.</strong></td>
<td>782234.7</td>
<td>595871.9</td>
<td>1040288</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Raw Mat</strong></td>
<td>682343.6</td>
<td>497061.4</td>
<td>885598.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Net Exp</strong></td>
<td>99891.1</td>
<td>98810.5</td>
<td>154689.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Expenditure / MT (Rs.)</strong></td>
<td>176.54</td>
<td>224.86</td>
<td>147.35</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Million Metric Ton

Source: Annual report of corresponding years.

Figure 6-20: Reduction in Production Cost at Indian Oil Corporation

6.2.3.3 Financial Performance of Operations

Table 6-10: Impact of ERP Implementation on Revenue and Net Margin at Indian Oil Corporation

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Turnover</td>
<td>150,729</td>
<td>183,204</td>
<td>220,779</td>
<td>247,457</td>
<td>285,398</td>
<td>271,074</td>
</tr>
<tr>
<td>Gross Profit</td>
<td>8,722</td>
<td>9,931</td>
<td>14,622</td>
<td>14,334</td>
<td>11,319</td>
<td>18,872</td>
</tr>
<tr>
<td>Net Margin</td>
<td>5.79</td>
<td>5.42</td>
<td>6.62</td>
<td>5.79</td>
<td>3.97</td>
<td>6.96</td>
</tr>
</tbody>
</table>

Source: Annual Reports of Indian Oil Corporation

* Due to High increase in Crude oil price from about $35 per barrel to $147 per barrel from July 2008 till the later part of the year the profit margins reduced drastically.
Figure 6-21: Trend of Net Margin at Indian Oil Corporation

![Graph showing trend of net margin from 2004-05 to 2009-10.]

Source: Adapted from Annual Reports 2004 – 2010 of IOC

6.3 Major Cost Variables for ERP Implementation

Enterprise Resource Planning (ERP) is a business management system which integrates multifarious functions of an organization. Computing the total cost of ownership (TCO) for each of the ERP project is extremely important.

On the basis of the survey and evaluated case studies of ERP implementation following costs have emerged as major cost components that includes Hardware Costs, Licensing Cost, Training and Knowledge Transfer Costs, Personnel / Consultants’ Costs, and Other Miscellaneous costs such as Server Installation Cost, Maintenance Costs etc including some hidden costs also, which may raise the TCO substantially. Investment required in ERP is very high and a meticulous planning is therefore required in the selection process. The mentioned cost are given below in detail for better understanding:

6.3.1 Hardware Costs:

i. Data center space capable of housing, powering, backup power;

ii. Special power requirements for uninterrupted power supply, power distribution units);

iii. Server hardware (viz., database server, application servers, other internet servers, management appliances, infrastructure servers such domain controllers etc);
iv. Disk subsystem hardware (each system in the landscape requires a database server and thus a disk subsystem, database, license and so on);
v. Network infrastructure (switches, hubs, routers and all cabling);
vi. Disaster Recovery infrastructure;

6.3.2 Licensing Costs:
   i. License fee and ongoing annual maintenance fee for operating system for each server;
   ii. License fee and ongoing annual maintenance fee for the Database Management System for each database server in every system of ERP system landscape;
   iii. ERP vendor license fees and ongoing annual maintenance fees;
   iv. License fee of tools and other service applications involved in supporting ERP;

6.3.3 Training and Knowledge Transfer Costs:
   i. Initial training costs for entire workforce involved in ERP implementation functional and technical as well;
   ii. Training cost of the end users and key users;
   iii. Costs involved in transferring the business process knowledge to consultants, support staff etc.

6.3.4 Personnel / Consultants’ Costs:
   i. Costs associated with hiring project manager(s), project coordinator(s), project librarian / documentation specialist and so on;
   ii. Costs related to technology-focused members like the Solution Architect, database administrators, application and other technical specialists’;
   iii. Costs related to functional specialists, developers, and business process experts, technical and functional consultants;
iv. Opportunity costs scarified by temporarily assigning people to the ERP project. Backfilling their previous line-of-business, technology support or other roles within the organization;

v. Travel and other infrastructure costs.

6.3.5 Costs of Professional Services

i. **Customization** The big chunk of costs of Professional Services is customization. The cost of customization can easily out-run the cost of packaged ERP software, but it is the customization of ERP software that makes an ERP a success or a failure.

ii. **Integration** ERP systems won't demonstrate its full potentials unless they are properly integrated with other enterprise software application:

a. the integration of various functional ERP modules,

b. the integration of ERP with other e-business software applications, and

c. the integration of ERP with legacy systems.

iii. **Data Conversion** The cost of data conversion depends on the format and the media that store the historical data. Data conversion from legacy systems to RDBMS is a time-consuming process. Data conversion may lead to further data gathering to fill the missing links in data requirements.

iv. **Testing** ERP systems are thoroughly tested before they go into production. ERP testing includes unit testing, component testing, regression testing, performance testing and user acceptance testing.

v. **Training** Workflow and UI design in ERP software are more complex than average business software. ERP training is expensive because workers almost invariably have to learn a new set of processes of doing their daily tasks besides learning how to use the ERP software. To reduce the cost of ERP training and to ease the transitions from old processes to new, organizations
often seek the help from training companies which are specialized in coaching workers on using ERP software from particular vendors.

6.3.5 Other Costs:

i. Management system costs (typically ERP aware application capable of monitoring the systems historically);

ii. Incremental Computer Operations costs, depreciation etc;

iii. Incremental Help Desk costs;

iv. Break / fix hardware maintenance contracts;

v. System installation (server, disk subsystem, OS, database, and each specific ERP component or product);

vi. Costs of middleware applications which integrates the legacy systems and ERP;

6.4 Major Benefits of ERP Implementation:

Global Industry Analyst Inc. (GIA) announces the release of a comprehensive global report on ERP Software market. The world market for ERP software is projected to reach US$67.8 billion by the year 2015. To keep pace with the competitive market conditions, the enterprises thrust for real time information on inventory and/or production across departments to ensure timely placement of order and processing. The benefits of ERP implementation can be categorized into two categories i.e. tangible and intangible:

6.4.1 Tangible benefits are those benefits which can be quantified in monetary terms. These benefits may be measured as the success of an ERP implementation. Cases above observe some combination of length of time to implement and specific business performance metrics including the standardization and the streamlining of business processes. Yet in determining Best in Class, we took the approach that the success of an ERP implementation needs to be measured in terms of the business benefits derived. Parameters of these metrics in manufacturing companies include reduction in costs and improvement in scheduling.
Reduction in Inventory\textsuperscript{31}: ERP helps in reduction of inventory through Increase in Stock Turnover, Reduced Number of days Stock in Inventory. It helps the stores department to maintain the stock in real time requirements and hence reduces the capital tie-up costs involved with Inventory. The average percent reduction in inventory management cost in the selected organisations is about 5\% and 20\% respondents also rated inventory management cost as the most important benefit.

![Savings after Enterprise Resource Planning software Implementation](image)

Reduction in Accounting and Financial operations Costs: ERP system enables the Finance department to faster generation of bills, faster payment to creditors, and hence helps in reducing the cash payment cycle, this also help in redesigning the financial processes so as to avoid various operational cost through real-time monitoring.

The average reduction in accounting and financial operations cost in the selected organisations is 15.48\% and 33\% respondents also said that the cost of managing accounting and financial operations reduces maximum through the ERP implementation.

(iii) **Reduction in Human Resource and Operations Costs**: HR and Operations costs may also be reduced by reducing the Cost for Performing a Specific Task, or by revenue generation by Increase in Sales etc. ERP also save on cost through identification of redundant processes in manufacturing organization etc. **The average percent reduction in Human Resource and Operations cost in the selected organisations is 17.41%** the result of survey also shows that only 23.33 % respondents accepts this as the most important benefit.

(iv) **Improved Efficiency in Production Schedule**: ERP software also give great results when it comes to effective production management through reduced cost and time for performing specific tasks. Decrease in cycle time, reduced
number of required employees and improved production planning is the result of ERP. The 13.33% of respondents have rated this benefit on the highest rank.

(v) **Reduction in Administrative Costs:** ERP software also give great results when it comes to effective management through very efficient and centralized Information system through ERP implementation. The 10.00% of respondents have rated this benefit on the highest rank.

Besides the results shown above, the interpretation of survey also shows what the surveyed official of various organisations suggest. The survey results related to the tangible benefits are given below:

**Table 6-11: Tangible benefits realization of ERP Implementation**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Tangible Benefits</th>
<th>Response (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Reduction in Inventory</td>
<td>20.00</td>
</tr>
<tr>
<td>2</td>
<td>Reduction in Manufacturing Operational Costs.</td>
<td>23.33</td>
</tr>
<tr>
<td>3</td>
<td>Improved Financial Operations</td>
<td>33.33</td>
</tr>
<tr>
<td>4</td>
<td>Reduction in Administrative Costs</td>
<td>13.33</td>
</tr>
<tr>
<td>5</td>
<td>Improved Efficiency in Production Schedule</td>
<td>10.00</td>
</tr>
</tbody>
</table>

Source: Survey Questionnaire

**6.4.2 Intangible benefits** are those that cannot be quantified in monetary terms but they do have a very positive and significant business impact. According the Shang and
Seddon (2002)\textsuperscript{32} it is not expected that every ERP system will produce all the benefits in each of the categories. they have given them as given below:

i. **Operational benefits:** ERP system can automate business processes and enable process changes. It is expected to provide the benefits in terms of cost reduction, cycle time reduction, productivity improvement, quality improvement and customer service improvement.

ii. **Managerial benefits:** ERP system may help the organization to achieve better resource management, improved decision making and planning, and performance improvement in different operating divisions.

iii. **Strategic benefits:** ERP system can help the organization with the benefits of supporting for business growth and business alliance; building business innovations, cost leadership and external linkages; and generating product differentiation.

iv. **IT infrastructure benefits:** ERP system provides business flexibility for current and future changes, IT costs reduction, IT infrastructure capacity improvement.

v. **Organizational benefits:** ERP system may be expected to improve working patterns, change work patterns, facilitate organizational learning, empower workers and build common vision.

Therefore, the adoption rationale and post-implementation realised benefits associated with the deployment approaches need to be analysed and presented in a format which facilitates the foundation of a framework for understanding why organisations embark upon their ERP and Data Warehousing implementation.

Most of the large companies have either implemented ERP or are in the process of doing so. Several large companies in India, both in the public and private sectors, have successfully implemented ERP and are reaping the benefits. Some of them are Godrej, Shang, S. and Seddon, P. B (2002), “Assessing and measuring the business benefits of enterprise systems: The business manager's perspective”, Information Systems Journal, 2002, pp. 271–299.
HLL, Mahindra and Mahindra and Essar Steels. With the near saturation in the large enterprise market, ERP vendors are looking to tap the potential in the SME segment.
Chapter 7

EMERGING CONCEPTS AND MODULES IN ERP SOFTWARE

7.1 Current Scenario of ERP Software
7.2 Major Problem Areas
7.3 Emerging Concepts and Modules in ERP Software
7.1 Market Scenario of Enterprise Resource Planning software

ERP has evolved a lot over the years; however, some more enhancements are likely to emerge. In near future people may see increased Web-based interfaces and object-oriented databases. Increased usage to Advanced Scheduling and Planning (ASP) is also expected.

ERP may also be widely used in smaller companies, and will not be just confined to big organisations. Future improvements in the Enterprise Resource Planning software will need less time to implement. Mr. Prashant of Tech Mahindra Consulting expressed his views that currently Enterprise Resource Planning products are available to address all business functionalities. Still customers do not need all functional modules at the time of implementation. This may lead to a new trend of component-based solutions. ERP vendors are in the processes of providing component-based product. One may decide to buy only sales and finance components, and can add materials and production later. This will address the budgetary constrains and the customer will pay only for what he needs. Hence the ROI model will look more attractive and business will be able to justify the investments effectively.”

Mr. Zoeb Adenwala, Head IT department, Pidilite Industries Limited also observed that "India is opening up and going global; and playing a very important role in the business of IT. If Indian companies have to survive and be competent in the global market, they have to move to ERP. If they don't, they will miss out on business opportunities. Enterprise Resource Planning implementations have moved from big companies to the SME segment. The SME segments are also competing and there is an upward trend in the market."

Today, ERP-systems are often based on a ‘best practice’. According to Johannson (2007)\(^1\) this often creates a “misalignment” between delivered functionality and needed functionality, This may be considered as a gap between the processes the ERP-system supports and the processes the organizations work by. Johannson (2007)\(^2\) mentions

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2. Ibid
increased implementations costs leading to unwillingness to customize the system to the business processes and inadequate processes of defining the business requirements.

What is the likely future of ERP solutions? What is the place of ERP solutions in the emerging Digital Economy? Arguably, ERP solutions provide the trampoline for more exciting technology. More exciting in that it goes beyond the enterprise itself into a closer collaboration with partners: the State, Suppliers, Customers, Employees, Banks etc. During the 1990s, ERP solutions have known a gradual evolution of their functional scope as shown in the figure 7-1 below:

**Figure 7-1: Development of Enterprise Resource Planning software modules**

- **ERP Basic Modules**
  - Finance
  - Logistics
  - Manufacturing
  - Human Resources
  - Etc.

- **Enhanced ERP**
  - SCM
  - CRM
  - etc

- **Web ERP**
  - Open ERP
  - SAAS
  - Web enabled technologies

On the contrary David et al. (2004) advocates for companies should follow the pre-configure ‘best practices’ inherent in the ERP-systems rather than the opposite. According to him one of the biggest mistakes that companies make is customizing software to fit their processes when they’d have been better off changing their processes to fit the software”. While the first ERP-systems needed a lot of customization to meet the business requirements this is far from the case today. In fact, in case of upgrading the existing systems into a newer ERP system, the modifications do not automatically adjust to the new version of the ERP-system, therefore, a new re-customization will be required.

The challenge of misalignment may be described by the assumption that implementing an ERP-system is an organizational change management project, which

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demands that either the organization changes or the implemented ERP-system is adjusted according to the organization. (Johansson and Newman, 2009)

India is a well known player in the ERP market. India occupies a promising position in the global IT market. The governments, educational institutions and companies are constantly working towards promoting and expanding the Information Technology. In this context ERP holds lot of promises both in terms of supply and demand.

The Year 2000 problem more popularly known as Y2K problem proved to be a biggest challenge to the nation who was still banking on IT skills for development aspects. This problem in itself helped to get another important solution. Firstly this paved way for more prospects in ERP market. The demand and supply gradually transformed from general to enterprise resource market. It is well evident that ERP market will boom and give the necessary impetus to stakeholders. However, this means that only the information haves shall survive in the market.

There is demand for ERP services and professionals. This naturally led to improvement in the quality of services modules offered. The end user are getting assured that they would be receiving the best services for the money invested. ERP in India is getting more and more competitive. The ERP implementation in India demanded more than the custom ERP India module.

7.2 Major Problem Areas

Today, the industry is currently facing following major issues, when it comes to future with Enterprise Resource Planning in the current scenario:

7.2.1 Sudden organizational changes

Sudden and fast changes are bound to increase the scope of ERP in enterprise operations. ERP in its initial life was back office functions oriented and

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later spread its wings to all the operations in the enterprise. This naturally meant that the ERP manufacturers and vendors had to increase the functionalities and scope of the application.

There are some practical difficulties when it comes to such issues. The ERP experts will definitely be able to restructure the ERP systems with the help of resources and expertise available with them. Compelling them to suddenly change will land things in a mess because there will be lot of confusions and changes required for the vendors, manufacturers and end-users.

7.2.2 Technical factors

Enterprise Resource Planning software necessitate for a restructuring in the technical aspects. The future of the business that have already implemented and deployed ERP remains a big question mark. Change is inevitable and required for growth, it will be impossible to change even before the current change has stabilized in the market. This may be advantageous for the companies that go for ERP at the first instance, but when it comes to companies that already run successful ERP systems they have to stick on to the technical changes or move out from the market. They will have to decide to stick on to change but it will cost them heavily or they can work on to find some new technology rather than going for an all round change.

7.2.3 Financial Constraints

One of the most important determinants of ERP market in India is finance. Some bigger companies still hesitate to invest in ERP due to the exorbitant costs. It is indeed encouraging to find that a vast majority of them have realized its benefits and have determined to go for it. However some of them are keeping quiet due to the risks involved besides the unforeseen expenses and losses.
According to Johansson and Bjørn-Andersen (2007) the future of ERP business requirements should aim at development of solutions that support the business of the end-customer. However, this process is difficult since the developers are not connected with the business users and hence there is a need for a moderator between the two parties.

### 7.3 Emerging Concepts and Modules in Enterprise Resource Planning Software

The study of various industry trends, views of professionals of some major IT companies and even User organizations indicates that the future ERP-systems should be involving following concepts:

#### 7.3.1 Role-based Enterprise Resource Planning module

For modern ERP-systems the dominant philosophy for identifying the business requirements has been to focus on business processes. This has lead to a situation where ERP-system in general can be characterized as process-based. This business process approach has necessitated consultation and discussions about the benefits of implementing ‘best practices’ for Enterprise Resource Planning software in the contemporary organisations. However, it could be argue that today’s process-based ERP systems focus enough on the employee roles. Instead Johansson and Bjørn-Andersen (2007) suggests that ERP-systems vendors should focus on support of employee-roles that crosses different business processes.

These roles should be understood as the grouping of tasks that a personal is responsible for or participate in, and therefore the business requirement gathering should aim to fulfill a one-point access for the different roles in an organization. Johansson and Bjørn-Andersen (2007) suggested that this approach will decrease the need for training, as it will be more intuitive to user for the end-user. However, a crucial factor in order to achieve this is that the metric to define the roles, as well as the roles themselves, are defined correct.

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5 Ibid Johansson Bjørn and Andersen (2007)  
6 ibid  
7 ibid
In this case the above mentioned approach for gathering the business requirements could very well be applied as this is also suggested within the 3g ERP Project framework. Johansson (2007)\textsuperscript{8} also mentioned that the roles could be categorized in task-oriented roles or managerial roles. Furthermore he suggests that the focus on role-based ERP-systems could change the often negative user perception of ERP-systems and thereby also change the adoption rate of ERP-systems that will lead the way for more successful implementations and in the end higher value realization.

For the ERP-vendors the challenges will be to identify and describe the relevant jobs and the work tasks that should be included. This also emphasis a specific problem while focusing on ERP-systems for small and midsized organizations that there are fewer employees and therefore relative less capabilities and specialized roles than in larger organizations. This means that the potential of the future role-based ERP systems for small and midsized organizations are dependent on the ability to support different roles within the same user interface or the enablement of easy shifts between different role-interfaces.

According to Johannson (2007) this is an area the requires a lot more research in order to determine the real potential of a role-based ERP-system. “The question remains if this is the way to go for Enterprise Resource Planning development if future Enterprise Resource Planning investments should decrease the gap between desired requirements and delivered functionality and thereby become a more successful investment for organizations”. Both Johansson and Bjørn-Andersen (2007) and Johansson (2007a) take part in the 3 generation Enterprise Resource Planning Project and their favor of the role-based ERP-systems approach over the current ‘best practice’-business process based approach harmonizes well with the work within project framework and their quest to challenges and improve current ERP-systems.

\textsuperscript{8} ibid
7.3.2 Open-source Enterprise Resource Planning Systems

Another research area within the next generation ERP Project is to evaluate the potential of open-source for development of ERP-systems. According to Riehle (2007)\(^9\) open-source software can be traced back to as early as the 1950’s and up to today where open-source software covers operating systems, application servers, security tools and ERP-systems. Open-source solutions can be divided into two types; community open-source software and commercial open-source software. These two types differ in the matter of who decides on the future direction of the software. In the community open-source software a community of volunteers together decided where the software is heading and what developments should be accepted to the software.

Despite the fact that this type of open-source software can be used for free, it has costs related to the usage in relation to learning, implementation and support. In the commercial open-source software approach the software is owned and developed with a for-profit approach by a vendor. In this case the business case for the vendor is cost saving from cheap development and earning from maintenance and support of the end users.

This aspect is going to have great scope for open-source software in general, but when it comes to open-source ERP systems the commercial breakthrough is yet to come. The reason to research within the development of open-source is primarily of a cost perspective as the vendor can benefit from savings.

Furthermore, Johansson and Sudzina (2009)\(^{10}\) provides 3 reasons for small and midsized organizations to adopt open-source ERP systems. The first open-source ERP system statement is that the open-source ERP systems address the mentioned ‘misfit’ challenge with better possibilities for customization, since it is possible to access the source code, that otherwise belongs to propriety rights of the vendor.

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As the customization possibility is seen as a benefit it clearly contradicts the current ‘best practice’ business-process approach. However, some current proprietary ERP-systems vendors already provide customers with most of the source code, and therefore this cannot be seen as a competitive advance of the open-source Enterprise Resource Planning systems only.

Amongst other ‘Microsoft Dynamics AC’ provide the customers with access to most of the source code. Furthermore, when it comes to community open source Enterprise Resource Planning systems, the customer will not be depended on one supplier, but can further develop the system itself even in the case that Enterprise Resource Planning system runs out of official maintenance.

In this regards though a positive side of the proprietary ERP-system is that it is often supported by certified consultants that secure the customer with a minimum of expertise, which can be more challenging to guaranty in the case of to open-sourced ERP-systems, and third, the licenses for open-source ERP-systems have a great potential of becoming a lot cheaper even if not completely free of cost, thereby saving the customer from a substantial expense.

However, according to Johansson and Sudzina (2009) the costs of licenses is only part of the project costs (estimated from one-third to one-sixth), and the expenses for consultants might exceed these savings due to lower market competition. Furthermore, the proprietary ERP-system vendor has obligation to the customer in terms of delivery and quality that is not necessarily included in open-source ERP-system engagements.

Open-source ERP-systems seem to have earned increasing interest, but the obvious benefits are still missing out, since the savings are transferred to other types of expenses, and there are no clear indices that suggest that open-source ERP-systems meet the needs of small and midsized companies better than existing proprietary ERP-system vendors.
A similar set-up with Enterprise Resource Planning system development could clearly make an interesting business case for the ERP-system vendors, but the question is then how to get that user commitment to an ERP-system.

Thus, there is a need for further research in this area and suggests the adoption rate of open-source ERP-systems in developed contra developing countries or the assimilation of the open-source ERP-system functionalities contra the assimilation of normal ERP-systems functionalities in organizations as interesting research areas.

7.3.3 The Enterprise Resource Planning system Value-Chain

While looking at the future ERP-systems, it is not only the solution features that are worth looking at the ERP-system value-chain can be interesting to look. According to Johansson (2007) the value-chain for ERP-systems covers at least following three stakeholders; ERP-system vendors, ERP-distributor and the ERP-system customer. In this relation the question is how these stakeholders different base for achieving competitive advantage influences the development of the future ERP-systems, but also how the future ERP systems will influence on this value-chain.

According to the resource-based view a resource can provide an organization with sustained competitive advantage if the resource is valuable, rare and costly imitate. When looking at the ERP system value-chain there are no obvious conflicts in competitive advantage between the three stakeholders, since they operate in different markets. The ERP-system vendor competes in the ERP-system licenses market, the distributor mainly competes against other distributors on consultancy services and ERP-system add-ons, while the end-customer competes in a market entirely of its own. However, the in order to compete in the market for ERP-system the vendors strive at delivering ERP-system functionality that meets the required functionality in the end-customer organization.

Therefore the more the aforementioned ‘misfit’ gap decreases, the more the ERP-systems vendors intervene in the distributors market (Johansson, 2007)\textsuperscript{11}. You could argue that this process is already happening to some extent, when the ERP-system

\textsuperscript{11} ibid
vendors include new functionality in the ERP-system, that earlier was covered as add-ons in the distribution channel and when the ERP-system vendors makes ‘best practices’ packages supposed to enable quicker implementation.

This is change to the benefit of the customer, while the distributors will need to fight even harder for the same business. In that sense the entire quest for better ERP-systems can challenge the current value-chain. To some extent the distributing channel has to rely on the basic thoughts among customer organizations that they need to have a system that is not the same as their competitors.

The distributors receive their competitive advantage by offering the end-customers industry insights on how to maximize the value of the ERP-system, which provides the end-customers with competitive advantage in their industry. In this regard it is important to note, that when it comes to the rareness aspect a non-rare resource cannot provide an organization with competitive advantage, but it can provide the organization with a disadvantage if the organization does not have this resource.

According to Karimi et. al (2007)\textsuperscript{12} an organization can no longer receive competitive advantage just by implementing an ERP-system, but Johansson (2007)\textsuperscript{13} suggest that not having an ERP system might be a severe disadvantage for an organization. However, the better packages the ERP-system vendors are able to deliver, the more the end-customers are willing to accept these packages and the less tough time the distributors will face.

Therefore it can be argued, that the distribution channel finds no point in developing more complete ERP-systems. This paradox can very well be seen in relation with the aforementioned contradictory paradigms on whether ERP-systems should be adjusted to the business processes of a company or if the company should adopt the ’best


\textsuperscript{13} (Ibid Johansson ,2007)
practice’ process inherent in the ERP systems represented with Johansson (2009)\textsuperscript{14} accordingly.

In relation to the entire discussion on the competitive advantage in the ERP-system value-chain Johansson and Newman (2009)\textsuperscript{15} states that “The basic thoughts the different stakeholders in the ERP value-chain have about competitive advantage is that highly customised ERP software deliver better opportunities for competitive advantage for the delivering reseller in the ERP value chain as well as for the ERP end-user organisations while it decreases the opportunity for ERP software vendors to attain competitive advantage”.

There seem to be rather contradictive forces within the Enterprise Resource Planning system value-chain. On the one hand the end customers search for competitive advantage through customization which benefits the distributors and seem to look for as much ‘best practices’ as possible in order to keep down implementation cost in favor of the ERP-system vendors.

This will defiantly influence the development of future ERP-systems since the gathering of the business requirements will be affected by the views from the different stakeholders.

7.3.4 ERP Systems as Software-As-A-Service (SAAS)

Software-as-a-Service (SAAS) is software delivered as a hosted application from a vendor or distributor that the end-costumer can access via a browser. The SaaS model enables the end-customer organization to decrease the cost of implementation, maintenance and the overall administration of the application that furthermore is independent of existing IT-infrastructure, scalable and flexible. (Guptil and McNee,


\textsuperscript{15} ibid
In that sense the end-customer organization can focus on its core business without worrying about technicalities that will be handled by the distributor.

There are examples of successful SaaS-vendors, eg. Salesforce.com, but when it comes to Enterprise Resource Planning systems delivered as Software-as-a-Service there is not yet a solution that has had a commercial breakthrough. However, as already stated the SaaS-model is a key strategic area for SAP AG and most likely also for other Enterprise Resource Planning system vendors. The SaaS-model is therefore of interesting when researching in the future of Enterprise Resource Planning system, however there is very less academic research published within this area yet.

When looking at the SaaS-model it seems to challenges the distributors business in the Enterprise Resource Planning system Value chain, since the vendor can deliver solutions directly to the end-customer and thereby bypass the distributor. Therefore this future delivery model might change the current Enterprise Resource Planning systems value-chain. This might not completely undermine the business for distributors, as the future Enterprise Resource Planning system value-chain very well could include hybrid SaaS-solutions, where the distributors offer the customized SaaS-solutions to the end customer. But if the SaaS-model becomes successful it can very well threaten the distributor’s position.

It could be seen as a further enhancement of the ‘best practice’ approach that undermines the competitive advantage of the distributors. In that sense the SaaS-model can be seen as a solution that favors the ‘best practice’ approach. Furthermore, it can be discussed if the SaaS-model can influence on whether an ERP-system is be perceived as competitive advance or not within the end-customer organizations, since the IT delivered hardly can be called a scarce resource.

This relates to the famous perspectives of Carr (2004) that suggests that IT does not offer a competitive advantage for organizations that do not have IT as a key

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competence. Instead these organizations could benefit from IT outsourcing, as IT to a large extent has become a commodity asset that is better handled by distributors or vendors that have IT as key resource. In that sense it could be interesting to look at the SaaS-model from a view of core competencies, for instance Hamel and Prahalad (1990)\textsuperscript{17} that advocates that organizations should focus on their core competencies. From this point of view organizations where IT is not considered a competitive advantage could benefit from outsourcing of their ERP-systems.

This has only been a short introduction to ERP-systems delivered as SaaS, which clearly is an area that could be interesting to research further within. It could be interesting to examine how ERP-systems delivered SaaS meet the Business IT needs of small and midsized organizations and what the implications are for the ERP system value-chain if the paradigm switches from perpetual licenses to SaaS offerings. Both the resource based perspective as well as the perspective of core competencies could offer interesting approaches when looking at the future ERP-systems and the value-chain.

### 7.3.5 Enterprise Resource Planning and The Internet

Another trend in Enterprise Resource Planning software development and use involves vendors making the software available to client companies on the Internet. Known as hosted Enterprise Resource Planning or Web-deployed Enterprise Resource Planning, this trend has also contributed to making Enterprise Resource Planning systems available to smaller businesses.

When a company chooses to run its Enterprise Resource Planning systems through Internet, the software is not purchased by or installed at the client company. Instead, it resides on the vendor's host computer, where clients access it through an Internet connection. According to Forger (2000)\textsuperscript{18} "Rather than dispersing ERP to multiple corporate sites and incurring the costs of many servers needed to run the software, Web-deployed ERP centralizes the system.". "Using the Web to access a single

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\textsuperscript{18} Forger, Gary (2000), "ERP Goes Mid-Market.", \textit{Modern Materials Handling}. 
ERP system at a central location, companies can reduce their IT investment on two fronts—hardware and personnel."

Running ERP systems on a host computer relieves small businesses from the need to purchase a mainframe computer or hire information technology specialists to support the system. In addition, this arrangement allows client companies to save money by paying only for the ERP applications they use rather than having to buy a certain number of modules.

In effect, ERP vendors act as application service providers (ASPs) for several client firms. "Systems supplied by ASPs are particularly attractive to start-up companies that can't reliably predict their future business volumes, can't afford to pay for first-tier ERP systems, and don't want to be continually replacing cheaper, less capable systems as their businesses grow," James and Wolf explained.

### 7.3.6 Supply Chain enabled ERP

Traditional ERP systems were concerned with automating processes and connecting typical information systems within a business enterprise. But during the late 1990s, an increasing number of businesses turned their focus outward, toward collaboration and forging technological links to other companies in the supply chain. "Increasingly, manufacturers in developed countries are becoming part of the design and production line of their customers," Adhikari, Richard (1999) wrote in *Industry Week*. "Tight scheduling requires automating the supply chain and enterprise resource planning functions and implementing electronic communications links." ERP vendors have responded to this trend by integrating ERP systems with other types of applications, such as e-commerce, and even with the computer networks of suppliers and customers. These interconnected ERP systems are known as extended enterprise solutions.

According to a survey by AMR Research reported in *Manufacturing Systems* “Sales of extensions to traditional ERP systems increased by 92 percent in 1999, and

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were expected to continue growing by over 50 percent annually”. In the meantime, sales of core ERP systems were expected to stagnate.

ERP systems have expanded to include several new functions such as application integration functions link ERP to other software systems that affect the supply chain. Visibility functions give companies an overview of inventory and its status as it moves through the supply chain. Supply chain planning software helps create optimal plans for producing and delivering goods. Similarly, customer relationship management software customizes the way that a supplier deals with each customer individually.

ERP has also been adapted to support e-commerce by facilitating order fulfillment and distribution, simplifying the process of electronic procurement, and tracking information about customers and their orders.

### 7.3.7 ERP for Small and Medium Enterprise (SME)

ERP has been moving to higher levels of delivery and efficiency. It forms an integral part of most manufacturing organizations and now with the growth of the SME segment, ERP implementations in SME are also happening.

This in turn has caught the attention of vendors and consultants. Most of the big vendors have realized the need to tap the SME segment since the large enterprise market is nearing saturation. The vendors are now offering condensed granular versions to suit the SME market along with their regular ERP solution portfolio.

Industry specific solutions with rapid implementation methodologies are being offered now-a-days. With more complex software it will take a more experienced person to implement the software, hence, raising the implementation costs. The size of the software will also increase, as the applications become more accessible.

Satish Gaonkar20, Head-Consulting Services Practice, Blue Star Infotech Ltd. said, "ERP would be just one component of the technology ecosystem of an organization. A one-size-fits-all scenario does not exist, and there would be other applications working with ERP to drive growth and efficiency. With growing recognition of business process

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management (BPM), another layer of BPM applications would be working with ERP, SCM, and CRM application integrated with EAI tools."

Mr. Dhruv Chadha, Enterprise Solutions, Marketing, Infosys Technologies observed that Most of the big companies have gone in for implementation of some ERP system. The major Enterprise Resource Planning software vendors have been targeting large sized companies till now and their products were more suited for such companies only. However, now they are seeing a potential in small to mid-sized companies and are coming up with products suited for the same. For instance, SAP recently launched its SME product ie. ‘Business One’. Oracle has also launched its SME version of its Oracle E-Business Suite, named it as EBS-SE.

In terms of technology, the Enterprise Resource Planning systems are evolving to more user friendly versions. They are in the process of moving from client/server technologies to being Internet-based applications. The self-service modules in the products are aimed at lay users who need not be trained for using the system.

To summarize, the trend definitely is moving towards integrated packages for decision support and large vendors are catering to these market segments and focusing on the complete range of Information Technology based services around these packages.
Chapter 8

SUMMARY AND CONCLUSIONS

8.1 Summary
8.2 Conclusions
8.1 Summary

This chapter, summarises the major conclusions and major key factors that Indian Multinational organizations should consider while implementing the ERP software in their Organisation, in order to implement it more cost effectively and attain better efficiency in organizational processes that are performed.

Chapter one elaborates on the conceptual framework of Enterprise resource planning software. The term Enterprise Resource Planning has evolved from Manufacturing Resource Planning (MRP II) that followed Material Requirements Planning (MRP I). Enterprise Resource Planning software are cross-functional and organization wide i.e Enterprise Resource Planning (ERP) software integrates all functional areas of business such as sales, logistics, billing, production, inventory management, quality management, and human resources management etc into one organization wide system. The magnificent performance of Enterprise Resource Planning systems established them as one of the most important development in the application of information technology in the Business world. Enterprise Resource Planning software serves as an information backbone for a number of big company’s core business processes.

Today, as we are aware every aspect in modern organization relies heavily on timely and accurate information to survive, in fact information system serves as the life-line of an organization as no process may be carried out without centralized information dissemination. The organizations are using Enterprise Resource Planning software for in all functional areas for gaining competitive edge among the competitors.

In a conventional organisation, each of the department typically has its own computer system optimized for the particular requirement of the department and Enterprise Resource Planning software combines them all together into unified, integrated software program that runs on a single database so that various departments can more easily share information and communicate with each other.
When a company has operated in a specific geographic market or a country for a long period of time, it needs to grow to achieve its growth targets. One solution to continue the growth is to expand into new emerging international markets. Organisations may spread out into multiple countries, the companies may do so as to reduce the risks that an organisation may faces, if conditions in one country changes drastically and adversely. A multinational manufacturing company does business in a number of countries with has substantial commitments of its resources in international business. The enterprise has to manage international production in some potential countries, and with global management perspective. Thus Enterprise Resource Planning (ERP) systems have emerged as a solution to address the challenges faced by Multinational Companies and are used to coordinate business activities, decisions making, and process knowledge across all functional departments, levels, and business units in an enterprise.

The Enterprise Resource Planning software weaves all organisational functions seamlessly into a centralized information system. The major ERP modules include Accounting and Finance Module, Human Resource Management Module, Business Intelligence Module, Customer Relationship Management (CRM) Module, Distribution Management Module, Inventory Management Module etc.

Implementation of Enterprise Resource Planning in big companies is very complex and expensive project therefore needs the help of professional consultants. Therefore, to implement Enterprise Resource Planning system, multinational companies often seek the consultation from Enterprise Resource Planning Vendor or hire a third-party consulting companies.

This chapter also sought to study the Enterprise Resource Planning Software market. Enterprise Resource Planning vendors need to ensure modification and customisation of their software package to suit the business’ processes needs of their customer. Of all Enterprise Resource Planning software providers worldwide, SAP-AG, Oracle, JD Edwards, PeopleSoft and Baan are the major Enterprise Resource Planning software vendors. These five major vendors together control approximately 70 per cent share of the market. The middle end vendors include SSA, BPCS, Inertia Movers, etc.,
that offer good functionality and can be implemented faster than the bigger ones. The low-end product vendors include QAD, MFG, PRD, etc., and can be implemented very fast particularly in the SME section, however, offer limited functionality.

Second chapter dwells on the fact that much literature that has been studied, gives an insight on the research issues. Most of the studies revealed that Enterprise Resource Planning software has enabled the organisations worldwide not only to recover its own implementation cost in short time but also to earn remunerative profits for the organisations. As Indian multinational companies are exhibiting great potential in global market and growing almost in all important sectors of business, Enterprise Resource Planning software may provide a competitive edge over its competitors. Though many studies have been conducted in some parts of the world yet none of the study not focuses on Indian Multinational Organisations that are still not utilizing the power of information technology.

The third chapter describes the objectives and research methodology of the study. While deciding on data collection method for the study, a number of factors have been considered. As every method has its strengths and weaknesses, it is important to evaluate each method’s appropriateness in regard to the study that was carried out. A study usually uses of both primary and secondary types of data decision making. Thus, the primary data was collected using structured interviews of the professionals from user and vendor organisations; however, for the collection of secondary data, we have used Internet based discussion forums, Enterprise Resource Planning system product information from suppliers and some company specific material such as annual reports, accounting and auditing reports. The study also focused on recent material that could be accessed. In order to get access to the latest developments in this area a number of articles published in academic journals and trade magazines have also been collected and properly cited.

When it comes to the methods used for evaluating the rationale of Enterprise Resource Planning software implementation, there are a number of alternatives available that include the traditional financial calculation models such as Return on Investment (ROI), Cost Benefit analysis (C/B), Return on Management, and Critical Success Factors.
This study has aimed to study Cost and Benefit relationship between successfully implemented ERP system and its effects on efficiency of business processes. The objective of the research is to concentrate on how the implementation of an ERP system platform impacts business processes and therefore the business performance. Attention has also been paid on the business objectives and organizational factors and their influence on the successful implementation of ERP software in multinational organizations operating in India.

Chapter four focuses on challenges to implement Enterprise Resource Planning software, based on historical perspective that were studied it is well documented that Enterprise Resource Planning systems have certain advantages such as low operating cost and improving customer service, but they have some reasons for dissatisfaction also due to the tight integration of application modules and the relevant data. Huge data storage requirements, computers networking requirements and personnel training overheads are frequently mentioned as Enterprise Resource Planning problems. However, the scale of business process re-engineering (BPR) and customisation tasks involved in the software implementation process have also been found among the major reasons for the dissatisfaction among Enterprise Resource Planning software organisations.

Baan, PeopleSoft, as well as SAP have also observed that some customers may spend between three to seven times more money on ERP implementation and associated services as compared to the purchase of the software license. This established that Enterprise Resource Planning projects are large, costly and difficult, as they require large capita investment and lots of time of staff and management.

Its high cost being detrimental to small businesses from setting up an Enterprise Resource Planning system, the network security concern within an Enterprise Resource Planning system and lack of trained people may affect Enterprise Resource Planning efficiency. Implementation of an Enterprise Resource Planning project is complex and customisation is costly and time-consuming. During the survey we have identified some major factors that act as challenges to successful ERP implementation that include resistance to change, successful changeover to newly implemented Enterprise Resource
Planning system, organisation wide proper training, unrealistic expectation with regard to cost reduction and process improvements, implementation project time overrun and implementation cost overrun.

A consensus among the respondents was seen that it is the implementation mainly and not the software as such which may turn out to be the major cause of failure in most projects. Further analysis of success or failure factors reveals that implementation has a significant affect on organisation in terms of organisation structure, organizational processes, the workplace and the individuals at Work, which may yields a positive or negative result.

Chapter five details the ‘critical success factors’ of Enterprise Resource Planning implementation based on the survey and studies based on Enterprise Resource Planning software implementation. Review of published material reveals major critical factors that may facilitate successful ERP implementations. These success factors include top management support, business plan and vision, business process re-engineering, effective team management, and the selection of suitable Enterprise Resource Planning vendor.

Chapter six deals with the study of selected Indian multinational organisations that include Bharat Petroleum Corporation Limited (BPCL), TATA Steels, Indian Oil Corporation (IOC), Oil and Natural Gas Corporation (ONGC), Maruti Suzuki, TATA Motors, and INDO-rama Group. However, the detailed analysis has been performed on BPCL, Tata Steels, and IOC. The case analysis on selected Indian multinational organisations was performed to analyse various costs and benefits of Enterprise Resource Planning software implementation and to test the established hypotheses.

Cost-benefit analysis, Test of significance (‘t’ Test) establishes that the ERP implementation reduces the major functional costs significantly, net profit trend and effect on production cost have also been tested in the selected organisations and the results were recorded.

In seventh chapter an attempt was made to the study the emerging concepts and module in Enterprise Resource Planning software that being in whole new dimension to
the working of the enterprise by reducing the cost of software as also its implementation. New concepts such as Web based ERP, Software as a Service (SaaS), and Supply Chain enabled ERP may bring in a paradigm shift; however, the result may take a few more years to be appropriately analysed.

8.2 Conclusions

The conclusions based on the present study as revealed by the conducted tests and collected data are given as below:

1. It is economically feasible and desirable to implement Enterprise Resource Planning software, and if implemented successfully, it would result in reduced costs on most parameters such as human resource and operations cost, accounting and finance cost and efficiency inventory management.

   The cost reduction on most parameters was found to be significant in Human Resource and Operations Cost (17.41%), and Accounting and Financial costs (15.48%), and Inventory Management Cost (5%), the average overall cost reduction in the above selected cost factors being 12.63 percent.

2. The study establishes that Enterprise Resource Planning Software implementation results in process improvements. The major improvements were found pertaining to efficiency and information transparency. All organizational processes are performed more efficiently in less time, less labor, and with less cost of operations. The improved processes enable an organization to perform more efficiently and provide increased services to both the organisation and their customers.

   The net margin earned has improved in all selected organisations studied namely Indian Oil Corporation, TATA Steels, and Bharat Petroleum Corporation Limited, However, in Bharat Petroleum Corporation Limited it has been observed that net margin after three years of ERP implementation got reduced due to systemic reorganization and crude oil price volatility.
3. The study indicates that the key critical success factors in Enterprise Resource Planning software implementation include top management support, timely decision making and implementation action, effective project management, training of staff, re-engineering of Business Processes and effective Change Management.

The cases of Hershey Foods Corporation (USA), Hewlett Packard, Motilal Oswal Securities revealed that such established organisations failed to realise the expected benefits of Enterprise Resource Planning system may be due to insufficient appreciation and management of these success factors including lack of proper training of staff, effective business process re-engineering, effective project management.

4. Study also revealed that the symptoms of Enterprise Resource Planning software implementation failure include implementation time overruns, budgeted cost overruns, and ineffective change management. More than about 54 % companies suffer from implementation time overruns, about 57 % companies spend more than budgeted cost, and less than 41 % companies realise the expected business benefits.

The Indian Oil Corporation lost more than Rs.350 crore per year due to project time overruns of the project by two years from the date of internal implementation i.e from year 2002 to 2004. Thus public sector undertakings may face a chronic problem and delays in implementation of the project that may result in huge losses.

5. The study has sought to evaluate as to how ERP systems impact multinational organizations and its business processes. It is noted that ERP software impacts the various operational processes more than others. The analysis of selected cases has demonstrated as to how processes have become more efficient with an integrated ERP platform. Such as the cost of production in Indian Oil corporation went down from Rs.224.86/ per MT in 2005 to Rs.174.54/MT in 2006 to Rs.147.35 in 2007.
Manpower cost reduction has also been identified in TATA Steels that revealed considerable cost reduction from Rs.200 per ton before Enterprise Resource Planning implementation to Rs.140/ ton after its implementation. In Maruti Suzuki also it is recorded that the design-to-launch time was reduced by 25% and further 15% more was targeted by them for future.

Though it is generally perceived that Enterprise Resource Planning software implementation is useful to organisations yet many organisations fail to implement it successfully and hence do not achieve the full benefits out of its implementation as they do not appreciate the various dimensions of its implementation. Un-realistic financial expectations and insufficient understanding of key implementation factors contribute to the failure of Enterprise Resource Planning software implementation.

It is hoped that the findings may be a guide and reference model for the Indian multinational organizations while considering critical decisions such as Enterprise Resource Planning software vendor selection, project implementation time, calculating total cost Enterprise Resource Planning software implementation and the expected cost savings in their business operations for the successful implementation of ERP software. This study will not only provide a clear understanding with respect to the economic analysis of Enterprise Resource Planning software implementation, understanding of Critical Success Factors, selection of suitable Enterprise Resource Planning implementation strategies, and Management of Organizational Change but also will help in eschewing the factors that may contribute to the failure of the project.
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**C-Reports**


**D-Web Resources**


Interview Questionnaire (ERP Implementation)

Dear Interviewer,

We are seeking the information for the research titled “Implementation of Enterprise Resource Planning (ERP) Software and Its Economic Analysis in Indian Multinational Organisations”. Information and data provided by you is highly valuable for us.

Declaration: The data that you provide will not be used commercially.

Name of Organization :  
Designation :  
Name of Employee (Optional) :  

Q1. What is the main objectives for the ERP project?

(a) Centralization of data  
(b) Cost efficiency in operations  
(c) Replacing old IT system  
(d) Enforcing organization competitiveness  
(e) Process efficiency and cycle time reduction  
(f) Centralized control of operations

Q2. Do you feel that the objectives have been achieved in general?

(Yes)  (No)  
If Yes, in what amount have they been achieved (%)?

a. Upto 25%  b. Upto 50%  c. Upto 75%  d. More than 75%

Q3. What were the most Critical Factors enabling the successful ERP project implementation? Rate them on 1-8 scale.

(a) Top Management Support  
(b) Communication Management  
(c) Team Motivation / Planning  
(d) Effective Change Management  
(e) Effective Business Process Re-engineering  
(f) Effective Project Management  
(g) Vendor Selection  
(h) User Training
Q4. What changes do you observe before and after the ERP project with respect to following?

- Business operations efficiency  (Increased) (Reduced)
- Organization hierarchy   (Increased) (Reduced)
- Operations Costs     (Increased) (Reduced)
- Other,     
  Please specify ____________ (Increased) (Reduced)

Q5. What are the major challenges do you see in ERP implementation? Please give order of importance:

<table>
<thead>
<tr>
<th>Factors</th>
<th>Rank (1-10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resistance to Change</td>
<td></td>
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<tr>
<td>Unrealistic expectations</td>
<td></td>
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<tr>
<td>Project management</td>
<td></td>
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<tr>
<td>Lack of implementation skills</td>
<td></td>
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<tr>
<td>Successful Changeover to ERP</td>
<td></td>
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<tr>
<td>Other1:</td>
<td></td>
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<tr>
<td>Other2:</td>
<td></td>
</tr>
</tbody>
</table>

Q6. Please rate the highest benefit of ERP Implementation according to you:

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Tangible Benefits</th>
<th>Please Tick</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Reduction in Inventory</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Reduction in Manufacturing / Operational Costs.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Improved Financial Operations</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Reduction in Administrative Costs</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Improved Efficiency in Production Schedule</td>
<td></td>
</tr>
</tbody>
</table>