A STUDY ON ENTERPRISE RESOURCE PLANNING SYSTEMS
AND EMBEDDING THEM INTO THE COMPANY PROCESSES

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I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

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ABSTRACT

A Study on Enterprise Resource Planning Systems and
Embedding Them into the Company Processes

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In this thesis, implementations of Enterprise Resource Planning Systems are studied with a broader view. Pre-implementation preparations and post-implementation developments play key roles in the success of the ERP utilization of the companies. To find out how the success can be achieved, various concepts in ERP implementation are analyzed. Using analogies with the basic software development models, common application methodologies are studied. The study is completed with the analysis of an interesting and challenging ERP implementation experience, focusing on the important decision points.

Keywords: ERP Systems, ERP Implementation Methodologies, Software Development Paradigms, Oracle AIM

ÖZ

Kurumsal Kaynak Planlaması Sistemleri ve Şirket Süreçleri ile
Bütünleştirme Çalışması

Gencel, Orhan

Yüksek Lisans, Bilişim Sistemleri Bölümü

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Bu tez, geniş bir bakış açısıyla, Kurumsal Kaynak Planlaması Sistemleri'nin şirketlere uygulanması üzerine yapılmış bir çalışmadır. Uygulama öncesi yapılan hazırlıklar ve uygulama sonrası yapılan geliştirme çalışmaları, şirketlerin, Kurumsal Kaynak Planlaması Sistemlerinden faydalanmaları açısından önem taşımaktadır. Başarı nasıl yakalanır sorusuna cevap bulmak amacıyla Kurumsal Kaynak Planlaması Sistemleri kavramsal olarak incelenmektedir. Yazılım geliştirme modelleri ile analojik bağlantılar kurularak uygulama metodolojileri anlatılmıştır. Çalışma, ilginç ve zorlu bir Kurumsal Kaynak Planlaması Sistemi uygulama deneyiminin analizi ile tamamlanmaktadır. Analizde, projede yapılmış önemli karar verme çalışmalarına odaklanılmıştır.

Anahtar Kelimeler: Kurumsal Kaynak Planlaması Sistemleri, ERP Uygulama Metodolojileri, Yazılım Geliştirme Modelleri, Oracle AIM

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INTRODUCTION

Companies operating in the today's business environment, face with a severe competition. With the help of globalization and internet, distances are getting closer and closer. Protective custom barriers for domestic firms are diminishing in time. Adding the technological developments, companies have two choices: improving themselves or waiting for an end which is not so far. There are different means of improvement for the companies; innovation, cost reduction, discovering new markets etc. Some of the companies prefer possessing unique information systems as an improvement. Difficulties of communication between different operational software packages inside the company, inconsistencies in data shared by different departments because of data duplication, desire to improve operational effectiveness maybe some reasons to possess unique information systems. For this integrated information systems, the most common name used is "Enterprise Resource Planning (ERP) Systems". Companies develop or outsource these ERP Systems, a typical cost of which is millions of dollars, expecting no tangible returns in the short term. Nevertheless, the success rate of ERP implementations is too low.

When ERP implementations are analyzed; during implementation, business process reengineering, information system design, operational culture change and new business role distribution activities are observed inside. Considering the activities

inside, it would not be wrong judging that implementation process is tough. After spending millions of dollar, failures can be disastrous for the companies, especially for the relatively small ones. In order to reduce that failure risk, academicians and vendor companies developed standardized methodologies. However, "how to succeed in ERP implementations" does not have an exact recipe

CHAPTER 2

ENTERPRISE RESOURCE PLANNING SYSTEMS AND IMPLEMENTATION METHODOLOGIES

2.1. Information Systems

As we move into the 21st century, global competition forces business organizations increase in intensity and complexity. In order to satisfy customer needs and desires, faster product development, more customized manufacturing and quicker distribution are the crucial capabilities for the competing organizations. Increase in consumer expectations and standards for high quality and quick service, creates challenges which are not historically present in the business life. To succeed in new challenges many firms utilize information systems.

Information systems are the means by which organizations and people, utilizing information technologies, gather, process, store, use and distribute information in business processes. "An information system is a system that uses information technology to capture, transmit, store, retrieve, manipulate, or display information used in one or more business processes." (Alter, 1996). Information technology is an association of physical hardware and logical software systems to supply information flow, storage and manipulation. Business process is a group of value-adding activities to perform business tasks utilizing different means of resources.

Information systems contribute contemporary organizations providing ability to perform precise, punctual, and efficient operations (standardization of information that flows through the business processes) that leads to effective management (in terms of control and decision making) and competitive advantage. Organizations taking the advantage of information systems to radically alter how they do business in both domestic and global markets obtain significant advantages against their rivals.

Organizations employ information systems in three different ways:

➢ Custom-built Systems

➢ Off-the-shelf Systems

➢ Hybrid Systems

Custom-built systems are originated from company's own business processes. Organization develops or has developed information systems customized to its own processes. Off-the-shelf systems are standardized systems according to common best business practices and developed to satisfy many (worldwide or sector-wide) organizations' business requirements. A Hybrid System can be defined as a combination of others. Standard part of the information systems is acquired, and the rest is developed custom. These two portions can be in varying amounts.

2.2. Enterprise Resource Planning (ERP) Systems

ERP systems be employed as either custom-built or off-the-shelf or hybrid system. Since development is too costly and technology demanding, ERP systems generally appear as off-the-shelf packages. There are some companies developing their own systems or sub-systems as well.

ERP systems have become popular means for both large and medium-size organizations to overcome the limitations of alienated and incompatible legacy systems. ERP systems are designed as an integrated set of software modules, all linked to a common database, handling a host of corporate functions such as finance, human resources, materials management, sales and distribution (Slater, 1998). Most ERP packages also provide multiple language and currency capabilities, allowing operations in different countries to become more integrated. In the era of globalization, such characteristics are very appealing for organizations desiring to expand their activities worldwide without losing control over them. The growing interest in ERP packages may be explained by their proclaimed benefits. ERP systems permit companies to implement fully integrated systems to replace their legacy systems, which are difficult to maintain because of their age, size, mission-critical status, and frequent lack of documentation. ERP systems are beneficial because they are integrated instead of fragmented, embed allegedly best business practices within software routines, and provide organizational members with direct access to real-time information (Ross, 1999).

ERP systems may be defined as "a software solution that carries out all the functions of an enterprise to succeed in organizational goals as a collection of integrated subsystems." (Enterprise Resource Planning). It provides efficient and consistent data gathering within the entire organization. It also establishes a common data infrastructure for the use of various functions and activities.

2.3. Evolution of ERP

The concept of ERP has been around since the 1960's. (Enterprise Resource Planning Systems and Supply Chain Management) Until 1972 ERP was just a concept without a name or classification. The companies had to integrate all departments and functions to increase revenues and strengthen the business. In 1960's, inventory control was assumed to have prime importance, therefore most of the software at that time were designed to help in inventory management. Typically, inventory management were handled by tools called BOM processors (Bill of materials)

The focus shifted in 1970's to Material Requirement Planning (MRP) as the complexity of manufacturing operations increased. The tools to support these continued to evolve by adding further functionalities to meet the increased requirements. These programs had been calculating material and sub assembly time dependent net requirements using the master schedule entered for the end products.

Then in 1980's, the concept of Manufacturing Resources Planning (MRP-II), which was nothing but extension of MRP to shop floor and Distribution Management activities, grew in importance.

In the early 1990's, increased complexity of businesses and the need to integrate all the functions within an enterprise to sustain in the dynamic environment lead to development of ERP (Enterprise Resource Planning) tool. ERP was extension of MRP II to cover the range of activities (Engineering, Finance, Human Resources, Project Management, Quality etc.) within any enterprise. (Figure 1)
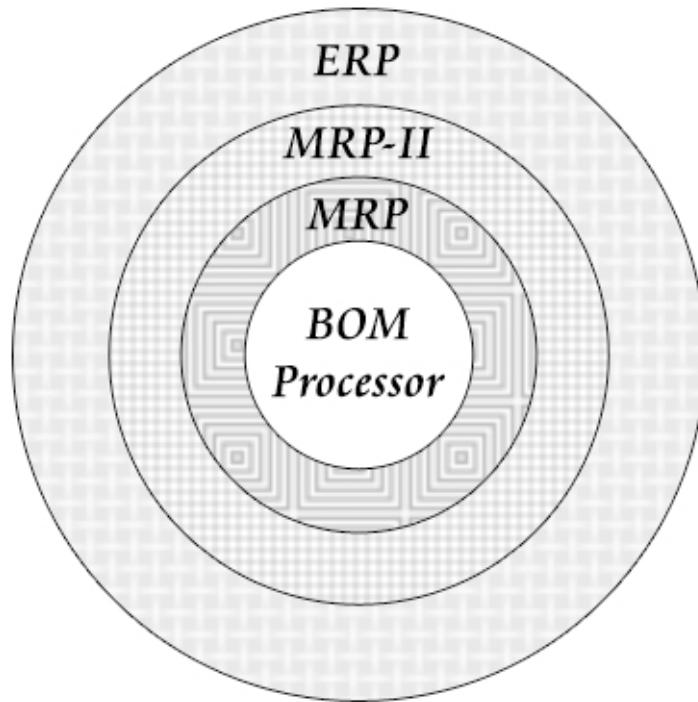
Figure 1 – Representational Diagram of the Evolution of ERP

2.4.   Needs and Benefits

The benefits accruing to any business enterprise on account of implementing are unlimited. According to the companies like NIKE, DHL, Tektronix, Fujitsu, Millipore, Sun Microsystems, the following are some of the benefits they achieved by implementing ERP packages: (Enterprise Resource Planning)

- Gives Accounts Payable personnel increased control of invoicing and payment processing and thereby boosting their productivity and eliminating their reliance on computer personnel for these operations,

- Reduce paper documents by providing on-line formats for quickly entering and retrieving information,

- Improves timeliness of information by permitting, posting daily instead of monthly,

- Greater accuracy of information with detailed content, better presentation, fully satisfactory for the Auditors,

- Improved Cost Control,

- Faster response and follow up on customers,

- More efficient cash collection, say, material reduction in delay in payments by customers,

- Better monitoring and quicker resolution of queries,

- Enables quick response to change in business operations and market conditions,

- Helps to achieve competitive advantage by improving its business process,

- Improves supply-demand linkage with remote locations and branches in different countries,

- Provides a unified customer database usable by all applications,

- Improves International operations by supporting a variety of tax structures, invoicing schemes, multiple currencies, multiple period accounting and languages,

- Improves information access and management throughout the enterprise,

- Provides solution for problems like Y2K and Single Monitory Unit (SMU) or Euro Currency.

ERP facilitates company-wide integrated information system covering all functional areas. ERP performs core corporate activities and aids in increasing customer service. ERP helps to bridge the information gap across the organization. ERP can provide for integration of systems not only across the departments in a company but also across the companies under the same management. ERP is a helpful solution for better Project Management. ERP allows automatic introduction of latest technologies like Electronic Fund Transfer (EFT), Electronic Data Interchange (EDI), Internet, Intranet, Video conferencing, E-Commerce, Customer Relationship Management (CRM) etc.

ERP facilitate eliminating many business problems like material shortages, productivity, enhancements, customer service, cash management, inventory problems, quality problems, prompt delivery, etc. ERP may not only address the current requirements of the company but also provide the opportunity of continually improving and refining business processes. ERP can provide business intelligence tools like Decision Support Systems (DSS), Executive Information System (EIS), Reporting, Data Mining and Early Warning Systems (Robots) for enabling people to make better decisions and thus improve their business processes. One of the most important functionality brought by this cross-enterprise system is the "multi capability" (multi-currency, multi-organization and multi-mode or mixed-mode manufacturing), representing the capability to compete and succeed globally. Today's total software solutions provide both multilingual and multi-currency capabilities enable to process currencies from different countries. They also provide multi-organization structure, which supports multiple divisions or companies work independently but under a corporate banner. Enterprises now employ a mix of

approaches including make-to-stock, highly repetitive, assemble-to-order or design-to-order which can be supported by multi-mode or mixed-mode manufacturing capability offered.

2.5. Cost of ERP

Mabert, Soni and Venkatamaran (Mabert, 1999) performed a survey study to determine the extent of package Enterprise Resource Planning system implementation. The study provided a view into the experiences of small and large firms based upon collected 479 respondents. The firms spanned a wide range in size as measured by revenue and employment. Appriximately 50% of the firms have annual revenues of less $250 million per year and employ less than 1000 workers. The smallest firm has 10 employees and $2 million in revenues. The largest has 240,000 and over $100 billion in annual revenues. The distribution of make-to-stock and make-to-order product mix was evenly balanced across the set of firms. The cost composition of a typical ERP implementation occurs as:

  ➢ Software cost (acquisition of ERP package): 30%

  ➢ Hardware cost (servers, networking etc.): 18%

  ➢ Consulting (during implementation): 25%

  ➢ Training (project members and end users): 10%

  ➢ Implementation Team (for full time and part time participation): 14 %

  ➢ Other: 3.3 %

  ➢ Considering the millions of dollars for the implementation of the ERP systems, two cost figures have a surprisingly significant amount of cost potential. One of them is consultancy with 25% of the total cost and the

other is implementation team cost with 15%. In ERP implementations, although ERP software and hardware costs are high, it is interesting to observe that more than 50% of the total cost is used for workforce utilized in the project.

2.6.   ERP Market

Worldwide enterprise resource planning (ERP) new license software revenue suffered a 9 percent decline in 2002, according to Gartner, Inc. (ERP Market) (NYSE: IT and ITB). In 2002, worldwide ERP new license software revenue totaled $5 billion, down from $5.5 billion in 2001. While 2002 was not a successful year for software providers, Gartner analysts said ERP application providers were able to reign in what could have been a potentially disastrous year.

SAP extended its lead in the worldwide ERP software market, with its new license revenue accounting for 25.1 percent of the market (Table 1). Oracle and PeopleSoft experienced a decline in market share in 2002, while SAGE and Microsoft Business Solutions experienced a slight increase in overall market share.

Table 1- Top 5 Worldwide ERP Software Application New License Revenue Market Share Estimates for 2002

Company	2002 Market Share (%)	2001 Market Share (%)
SAP AG	25.1	24.7
Oracle	7.0	7.9
PeopleSoft	6.5	7.6
SAGE	5.4	4.6
Microsoft Business Solutions	4.9	4.6
Others	51.1	50.3
Total Market Share	100.0	100.0

Source: Gartner Dataquest (June 2003)

All segments of the ERP software market experienced a decline in revenue in 2002. The financial management software market continued to lead all subsegments of the ERP market, but its revenue declined 8 percent in 2002. Manufacturing and human capital management (HCM) experienced the largest decline with 12 percent and 10 percent declines, respectively, in revenue in 2002. Despite Worldwide ERP Market Decline, SAP Retains Leadership in 2002. The Alert provides statistics on the top-tier vendors within the ERP software market, as well as statistics on ERP sub-segments.

2.6.1. SAP

SAP was founded in 1972 in Mannheim Germany. The company, now known as SAP (Systems, Applications, Products in Data Processing), was started as Systemanalyse Und Programmentwicklung. SAP aims to provide systems that enable companies to optimize supply chains, strengthen customer relationships, and make more accurate management decisions. SAP is the recognized leader in providing collaborative business solutions for all types of industries and for every major market. SAP is headquartered in Walldorf, Germany and it is the largest inter-enterprise software company, and the third-largest independent software supplier overall. SAP employs over 28,900 people in more than 50 countries (2003) and has a market share of 25% (2002) (SAP)

2.6.2. Oracle

Oracle, founded in 1977, is now the world's second largest software company and the leading supplier of software for enterprise information management. The company offers its database, tools and applications products, along with related consulting, education, and support services. Oracle employs more than 40,000 professionals in more than 100 countries around the world. On June 18, 2003, Oracle announced that it will increase its cash tender offer to purchase all of the outstanding shares of PeopleSoft, Inc. (Oracle) Oracle has a share of 7.0 % in ERP market (2002) (See Table 1).

2.6.3. PeopleSoft

PeopleSoft started its operations in 1987 to design client-server applications. In 1988, the first product PeopleSoft HRMS for Human resources market was released and today commands more than 50% of the human resources market. On July 28, 2003, PeopleSoft Inc. has completed acquisition of J.D. Edwards & Company, making PeopleSoft the second largest enterprise applications software company in the world. (PeopleSoft) Oracle has a share of 6.5 % in ERP market (2002) (See Table 1).

2.7.   What's Next?

In the later part of the 20th century, companies expected enterprise technologies to provide the ultimate in supply chain capabilities. Integration, collaboration and optimization were the buzzwords of sure success. It would seem a company only needed to purchase and implement these tools before their competition in order to see revenue sky-rocket and costs wither. As a result, companies around the world spent billions on enterprise resource planning (ERP), advanced planning engines, and customer relationship management (CRM) systems. Unfortunately this confidence in technology was misplaced. Only a very small number of implementations were successful.

Enterprises are starting to transform themselves from vertically integrated organizations focused on optimizing internal enterprise functions to more-agile, core-competency-based entities that strive to position the enterprise optimally

within the supply chain and the value network. A primary aspect of this positioning is engaging not just in B2B and B2C electronic commerce, but in collaborative commerce (c-commerce) processes as well.

> "*Collaborative commerce*, also referred to as c-commerce, involves the collaborative, electronically enabled business interactions among an enterprise's internal personnel, business partners and customers throughout a trading community. The trading community can be an industry, industry segment, supply chain or supply chain segment." (ERP Is Dead – Long Live ERP II)

ERP vision was centered on resource planning and inventory accuracy, as well as visibility beyond the plant and throughout the manufacturing enterprise, regardless of whether the enterprise was a process manufacturer, discrete manufacturer or both. ERP has since appeared in different "flavors." Extended ERP reflected the fact that many non-manufacturing industries turned to ERP systems for "backbone" financial transaction processing capabilities. As enterprises looked to applications that would provide Supply Chain Management (SCM), Customer Relationship Management (CRM) and e-business functionality to enable them to jump ahead of their competitors, ERP vendors responded by pursuing the vision of the enterprise application suite (EAS), either through partnerships, acquisitions or native product developments. However, the EAS's unwritten mantra of providing "all things to all people" within the enterprise renders it ill suited to a future that demands focus and external connectivity. The ERP II vision addresses the future by focusing on deep industry domain expertise and inter-enterprise, rather than just enterprise business processes (Bond, 2000).
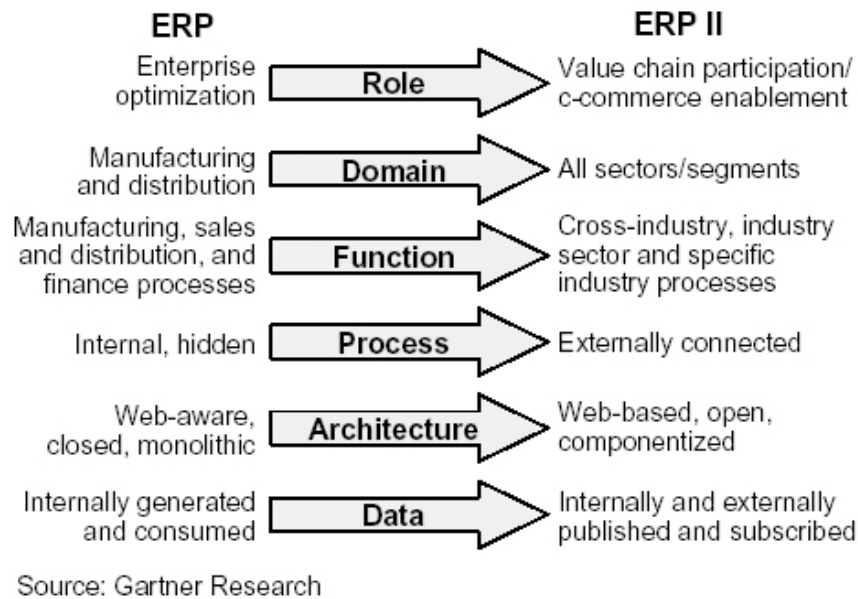
Figure 2 – ERP-II Definition Framework

2.8. Evaluation of ERP Systems and Consultant Partners

In order to evaluate ERP Systems, important factors should be figured out and construct the baseline of the assessment.

Some factors can be considered strategic level factors:

- ERP's contribution to business vision and strategy

- Alignment of business and technology strategy

- Flexibility and scalability of IT architecture

- Flexibility and adaptability of ERP solution to changing conditions

- Integration of business information and processes

- Identification of the various components and magnitude of the project's risk

- Impact of ERP on the decision making process

- Competitors' adoption of ERP

- Impact of ERP on cooperative business networks

- Estimation of future intensity of competition and markets deregulation

- Impact of the decision to implement or not an ERP system on the competitive position and market share

- Estimation of the total cost of ERP ownership and impact on organizations' resources

- Analysis and ranking of alternative options in terms of the competitive position of the organization

Some factors to be considered in ERP evaluation at the operational level:

- Impact of ERP on:

  o Transactions' costs

  o Time to complete transactions

  o Degree of business process integration

  o Intra- and inter-organizational information sharing

  o Business networks

  o Reporting

  o Customer satisfaction

- Estimation of costs due to:

  o User resistance

  o Personnel training

  o External consultants

o   Additional applications

o   System downtime

2.9.   Embedding ERP Systems

Here, the term "Embedding ERP Systems" is used instead of commonly used term "Implementation of ERP Systems" to figure out the important point when the ERP systems bond the company processes. Implementation is a highly money, time and effort consuming process. At the end of the implementation project, companies start to utilize the ERP Systems but that does not end up the problems regarding the company processes and the ERP system. Therefore, activities after implementation project have an important role to succeed in the ERP utilization at the company processes. After the "live date"; the ERP systems have to bear new problems, new needs, and new desires. Continuous feedback and requests start from the company-wide end-users and the executive. Everyday they introduce the characteristics and the capabilities of the ERP system. In addition, they reply to their requests and feedbacks turn out to be a norm in the assessment of the ERP success. That means, the end of the implementation project turns out to be a beginning for a new challenging exam for both the ERP systems and the previous implementation period.

2.9.1. Standard ERP Package vs. Customized Development

Standard ERP Package Implementation involves adaptation of the ERP package to suit the user requirements. This requires a thorough understanding of the technical aspects of the ERP package as well as the functional aspects of the business. To the

extent which ERP Package flexibility allows, implementation project team works together in order to meet the company process requirements with the capabilities of the standard package. The standard packages, already designed for best business practices by the ERP vendors mentioned in the previous section, are not to be expected to fulfill the company own business processes. Therefore, most of the time, company processes are changed to obey package functionalities.

Customized development covers both the custom-built systems and the hybrid systems. (See Section 2.1) In custom development, company develops or outsources its tailored ERP systems for business processes. In custom development, companies may achieve more suitable systems with respect to standard ERP Packages. However, custom development requires all software development steps including requirements specification, modeling, coding, testing etc. These critical steps may be highly demanding in terms of IT staff. Employing or outsourcing a qualified and large software development team cost outside the affordable level for the companies.

The main reason for choosing standard packages rather than custom development is rapid innovations in the IT industry. ERP vendors generally support their clients to enhance their ERP systems with newer versions developed periodically. Following the new technologies may be impossible for custom-built ERP systems. In addition, system guarantees, supplied by the vendors, only cover the standard functionalities of the Packages for maintaining and upgrading (there are some exceptions for the compulsory customizations especially in legal accounting modules). Therefore, companies intend to have customization as less as possible.

2.9.2. Comprehensive vs. Stage-wise Implementation

Comprehensive Implementation can be called "at-once" implementation. Business process improvements, customizations, possible high level integrations, multiple sites should be handled within the implementation project. Project duration may be years, but all of the ERP functionalities and modules are implemented in parallel considering the necessary integrations.

Step-wise implementation is the opposite of the comprehensive implementation. Companies choosing this kind of implementation aim to spread costs, risks, company resistance, improvements and integrations through several times of implementation and years. Generally modules are sorted sequentially and implemented partially. Possible positive and negative impacts of ERP divided and are digested by the system in pieces.

Step-wise implementation has several advantages with respect to comprehensive implementation. Considering the disappointing success level of ERP implementations, dividing risks, costs, time constraints in time, increase the chance of success. On the other hand, step-wise implementation leads to many problems for the integration requirements of the newly implemented modules with the previous ones. Lack of contribution from other "unrelated (!)" departments may lead to disastrous results for the ERP's unified medium of processes.

2.9.3. Customization during Implementation Process

During the ERP implementation, the demand for changing the standard package is common. Customization features of the ERP systems allow the system to be

modified to meet the organization's unique requirements without destroying the integrity of the packaged system. For instance, the system may allocate parts of its files or database to maintain the organizations unique data.

During the upgrades of the system, most of the times the customization exercise has to be repeated and maintenance of consistency in changes becomes a problem. This makes it more difficult to implement the package and considerably increases the risks and associated costs and changes schedules. However, it must also be emphasized that implementation without any customization is easier said than done, especially when it leaves some users dissatisfied, leads a feeling that the ERP program has not meet their requirements.

2.9.4. Importance of Pre-Implementation Activities

Pre-implementation activities create the foundation for implementation success. These steps assume that the system selection and justification process has been completed.

- Organizing the implementation project. Setting up the implementation team and stock it with your company's smartest workers.

- Deciding on the implementation approach. There are two different ways that ERP can be implemented − all at once, across the entire organization, or using a phased approach by module, by product line, or by plant.

- Defining the performance measures for the new system.

- Creating the initial detailed project plan. The implementation team prepares a schedule for the entire project and makes sure that all resources will be available as needed.

- A clear statement of work or scope of the project is necessary. This scope should include the modules selected for implementation as well as the business processes that will be included. Scope creep is a very common problem in ERP implementations.

- Educating key individuals.

- Assessing the integrity of the existing data. Address and correct any vital problems.

2.9.5. Post-Implementation Developments

After the ERP system is successfully implemented, companies should be aware that nothing will be same as before. Studies indicate that the minimum time to see the effects of ERP in the company processes is one year. During that one year period, problems about learning, resistance to change, lacks on the ERP design, technical inexperience are inevitable. At the beginning of the utilization, user originated problems will be available. After the learning period, the company staff will request further functionalities if possible. Since, ERP systems create significant improvement in easiness to reach the required data; the adaptation period is very short for the other company staff and new report requests and then new functional requirements are asked in few weeks. Adding that, other system related problems make the project group as the vendor of the ERP system within the company. Therefore the project group should be prepared for the following:

➢ Vendor's Post Implementation Support: For advanced problems, technical and functional support of the ERP vendor should be available.

➢ Maintenance and Timely Response: For a certain time period, project group should act as a serious maintenance service firm. Otherwise, adding the resistance to change, minor problems turn out to be unbearable ones.

➢ Change Management: Unsystematic changes may lead to lose control over the changes, therefore a configuration management system is recommended.

➢ Feedback Monitoring: After the learning process of the company staff, requests may tend create queues. In order to prioritize the requests, utilization of an analyzing system may be useful.

2.10. Assessing the Success of an ERP System

One of the biggest mistakes, made during the assessment the success of an ERP system, is perceiving newly implemented ERP system as an alternative for the existing business processes and comparing the systems before and after the implementation.

Generally, ERP implementations are performed by a project group in the companies. This project group reengineers the business processes within the ERP system capability boundaries and commonly presented to the rest of the firm after the implementation completion. One of the important points is understanding ERP system as a tool to improve our business processes, practices and discipline. Whether the company processes were too stable before and after the implementation, and it is expected that ERP system will solve all the problems, a disappointment is inevitable and this statement will rise: "We do our jobs before the ERP, now we are doing them in a different way; although some activities became easier, some extra compulsory requirements were added with the ERP". Adding the

learning duration inefficiencies, ERP may face with unfair critics in term of pros and cons. It is common that, companies prefer to new ERP systems rather than their own processes and managers. Adding that, surveys indicate that positive effects of ERP implementations appear at least 1 year after the "go live" date."

2.11. Application Implementation Methodologies

2.11.1. Application Implementation Methodologies

2.11.1.1   Classical Life Cycle

In the Classical Life Cycle Model: the project proceeds according to clearly defined phases; a proceeding phase must be completed before the next starts; phase completion is judged by the outcome of the phase matching the requirements defined by the previous phase. This is natural and logical - how rational and careful people proceed: `look before you leap'. Not that all software developers, or project students, are rational and careful; and it is easy for the inexperienced to misjudge the levels of complexity, novelty or risk.
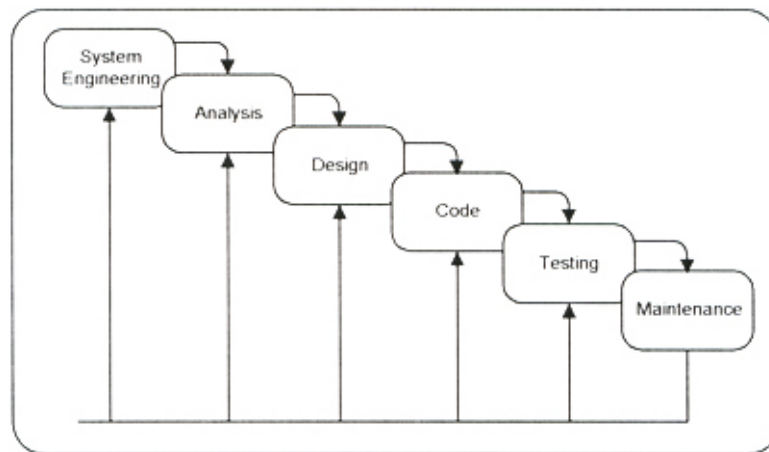
Figure 3 – Life Cycle Model Paradigm

Problems:

- Lack of process visibility

- Systems are often poorly structured

- Special skills (e.g. in languages for rapid prototyping) may be required

Applicability:

- For small or medium-size interactive systems

- For parts of large systems (e.g. the user interface)

- For short-lifetime systems (Waterfall Model)

2.11.1.2 Prototyping

Prototyping is a process that enables to create working models to learn the requirements of the system.
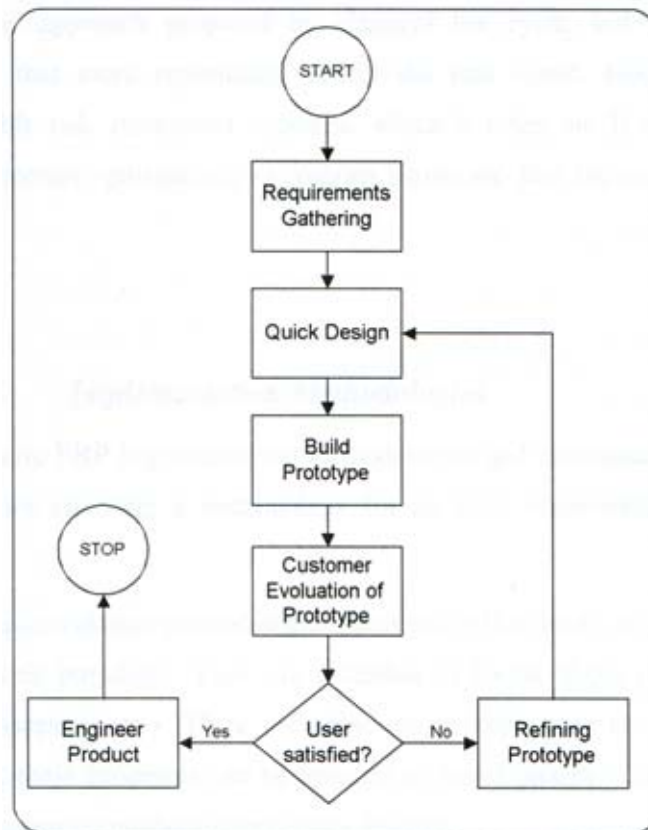
Figure 4 – Prototyping Model

Throwaway Prototyping Model

The approach is to construct a quick and dirty partial implementation of the system during or before the requirements phase. It is useful in "proof of concept" or situations where requirements and user's needs are unclear or poorly specified.

Evolutionary Prototyping Model

It is used in projects that have low risk in such areas as losing budget, schedule predictability and control, large-system integration problems, or coping with information ambiguities, but high risk in user interface design.

The risks of Prototyping are as follows:

- Standardization--Prototypes, particularly in a high-technology prototyping environment, tend to be shaped by the tools that are available, rather than by users' needs.

- Distraction--Work on the prototype can take attention away from the problems to be solved.

- Seduction--Developers can be trapped in an endless loop of refinement.

- Rejection--If the cost of implementing an idea is too high, ideas will be rejected too early in the cycle.

- Obscured historical perspective--Prototypes tend to lose the reasoning that went into them--why decisions were made, for example, or which requirements led to a set of behaviors or functions. (Life Cycle Models)

2.11.1.3   The Spiral Model

The spiral model, basically, the idea is evolutionary development, using the waterfall model for each step; it's intended to help manage risks. Don't define in detail the entire system at first. The developers should only define the highest priority features. Define and implement those, then get feedback from users/customers (such feedback distinguishes "evolutionary" from "incremental" development). With this knowledge, they should then go back to define and implement more features in smaller chunks.
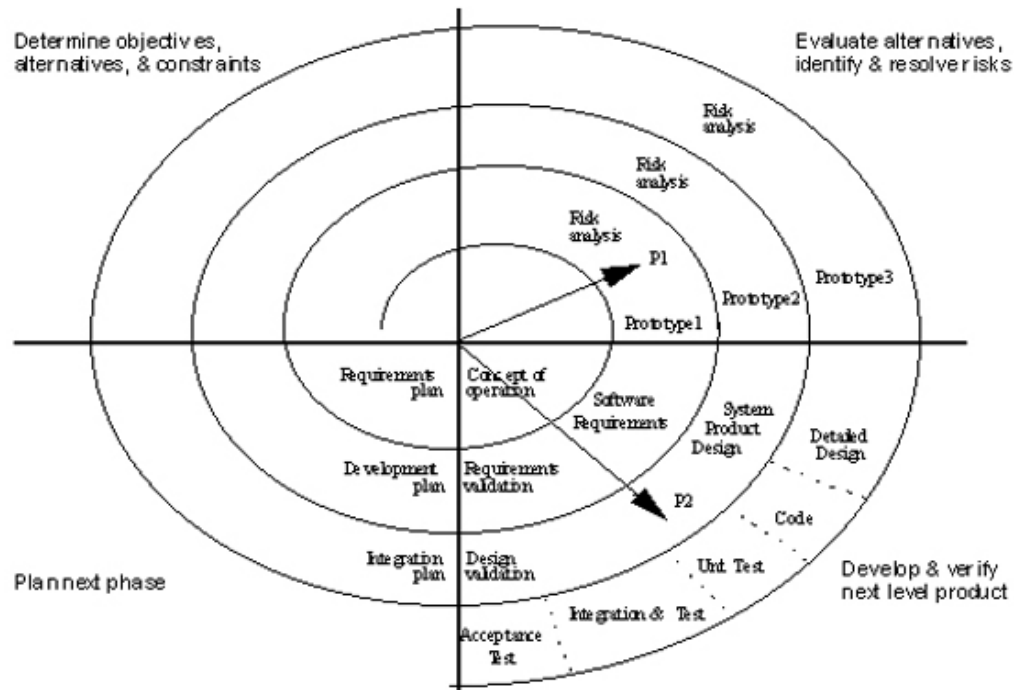
Figure 5 - Spiral Model Paradigm

The spiral model is the most generic one among the other models. Most life cycle models can be derived as special cases of the spiral model. The spiral uses a risk management approach to software development. Some advantages of the spiral model are:

- Defers elaboration of low risk software elements

- Incorporates prototyping as a risk reduction strategy

- Gives an early focus to reusable software

- Accommodates life-cycle evolution, growth, and requirement changes

- Incorporates software quality objectives into the product

- Focus on early error detection and design flaws

- Sets completion criteria for each project activity to answer the question: "How much is enough?"

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- Uses identical approaches for development and maintenance

- Can be used for hardware-software system development (Spiral Model)

2.11.1.4 Implementation Methodologies

Methodology refers to a systematic approach to achieve a challenging goal. A methodology is a roadmap to an implementation. The purpose of a methodology is to deliver an implementation on time, according to specifications and within budget. Most vendors, especially in the software industry, have developed their own methodologies (Methodology I). ERP methodologies are built on the theory that an enterprise can maximize its returns by maximizing the utilization of its fixed supply of resources (Methodology II).

Generally, implementation methodologies are typically extensions of classical life cycle paradigm. They are extended to handle implementation specific processes (Mapping etc.) There are some major steps gone through in most of the methodologies and these processes can be grouped in major phases:

Markus and Tanis (2000) identified the following phases in an ERP life cycle:

- *Chartering*: decisions defining the business case and solution constraints;

- *Project:* getting system and end users up and running

- *Shakedown:* stabilizing, eliminating ``bugs'', getting to normal operations

- *Onward and upward:* maintaining systems, supporting users, getting results, upgrading, and system extensions.

The chartering phase comprises decisions leading to funding of the ERP system project. Key players in the phase include vendors, consultants, company executives,

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and IT specialists. Key activities include initiation of idea to adopt ERP, developing business case, decision on whether to proceed with ERP or not, initiation of search for project leader/champion, selection of software and implementation partner, and project planning and scheduling. The project phase comprises system configuration and rollout. Key players include the project manager, project team members (mainly from business units and functional areas), internal IT specialists, vendors, and consultants. Key activities include software configuration, system integration, testing, data conversion, training, and rollout. In this phase, the implementation partners must not only be knowledgeable in their area of focus, but they must also work closely and well together to achieve the organizational goal of ERP implementation.

The shakedown phase refers to the period of time from "going live" until "normal operation" or "routine use" has been achieved. Key activities include bug fixing and rework, system performance tuning, retraining, and staffing up to handle temporary inefficiencies. In this phase, the errors of prior causes can be felt, typically in the form of reduced productivity or business disruption (Markus and Tanis, 2000). Hence, it is important to monitor and constantly make adjustments to the system until the ``bugs'' are eliminated and the system is stabilized.

The onward and upward phase refers to ongoing maintenance and enhancement of the ERP system and relevant business processes to fit the evolving business needs of the organization. It continues from normal operation until the system is replaced with an upgrade or a different system. Key players include operational managers, end users, and IT support personnel (internal and external). Vendor personnel and consultants may be involved when upgrades are concerned. Key activities include

continuous business improvement, additional user skill building, upgrading to new software releases, and post-implementation benefit assessment.

2.11.1.5 Classical Life Cycle vs. Implementation Methodologies

The most common ERP implementation methodologies (especially ASAP and Oracle AIM) are the extensions of classical life-cycle paradigm. Though, non-existence of software development and ERP packages' main characteristics cause some differences between the classical life-cycle paradigm and implementation methodologies.

Involvement of the client into the project is the most significant difference. In ERP implementations, client full-time involvement into the project is must for success. This is possible when client dedicates or recruits (if needed) personnel that will be freed from daily work activities of the client and fully focused on project activities owned by the organization. In classical life cycle, the project team generally comprises technical specialist who are responsible for successful completion of all phases of the development. Users are generally involved in the project by participating in requirements analysis, review and sign offs. In ERP projects, on the other hand, the project team comprises not only consultants from implementation partners (or vendors) but also business specialists (staff, chiefs or business line managers) who are trained for the functionalities of application, and who are also responsible from performing and documenting implementation steps.

Other noticeable difference is the supplementary tools, which generally embed package specific functionalities and support methodology through all phases.

Templates and questionnaires that simplify and guide requirement analysis and documentation, package specific estimation methods, project management and configuration management tools, etc. are some of the facilitators that also shape the quality of the work performed.

2.11.1.6 How Spiral Model can be utilized in ERP Post-Implementation Developments?

Spiral model is the best-suited model in order to cope with the required developments. First of all, post implementation should be considered as the continuation of implementation process. The same discipline should be sustained in order to avoid any interdepartmental contradictions. Changes should be at small sizes and analysis, design, testing and implementation steps should be followed. All of the possible outcomes should be analyzed. Otherwise, harmony in business processes, data uniqueness and system designed, established during the implementation, can be ruined.

2.11.2. Estimation in Implementation Projects

2.11.2.1 Functional Complexity

Level of functional distribution among ERP system affects the functional complexity. Number of applications applied during the implementation and common functionalities between these applications increases the possible interdepartmental problems, decrease process design flexibility.

2.11.2.2 Level of Supply Chain Automation

Since off-the-shelf ERP packages are designed for best practices, business process complexity directly increase the modeling problems during the implementation. Pre-implementation automation level can affect the implementation period in both ways. Automated systems generally contain organized data, however since the automated systems are effective than the other, the best tool used by the resistance to change is effective and existing automated systems even if they are standalone.

2.11.2.3 Number of Users

Roles, approval processes, level of hierarchy and security access terms are all the source of change resistance. Everybody resists to any decrease in one of them during process designs.

2.11.2.4 Number of Sites

Number of sites where the ERP implementation takes place directly creates problems in the implementation. To solve any possible conflicts, project manager's position should be higher than the site managers. Inter-site processes and security of inter-sites communication can be problem areas.

2.11.2.5 Level of Readiness with Old/Special Software Systems

Pre-implementation preparation directly affects the implementation. Process readiness for ERP system, data transactions are significant advantages before

implementations. However, data should be properly controlled for any possible conversion.

2.11.2.6   *Characteristics of Project Participants*

Experience, education/training, willingness level of the project participants directly affects the implementation in positive. Part time participation of project staff is a potential danger for attendance to meetings, preparation of documentation and concentration level. For a more effective project group, a supervisory group is a significant advantage for both decisions making and solving interdepartmental conflicts.

2.11.2.7   *Level of Consultancy Service*

Level of consultancy is very important for the implementation. The experience and availability of consultancy play key role in the success of the implementation. However, generally consultant group is composed of functional experts. Since they were too much specialized on one part of the system, they may have problems about solving inter-modular processes or problems about the other ones.

2.12. Common ERP Implementation Methodologies

2.12.1. Oracle Application Implementation Methodology (AIM)

Oracle's Application Implementation Method (AIM) is a proven approach for implementing packaged applications. It is comprised of well-defined processes that

can be managed in several ways to guide you through an application implementation project. AIM provides the tools needed to effectively and efficiently plan, conduct, and control project steps to successfully implement business applications.

AIM tasks are organized into processes. Each process represents a related set of objectives, resource skill requirements, inputs, and outputs. A task can belong to only one process. Project team members are usually assigned to a process according to their specialization and background. The following figure illustrates the AIM processes and the process overlap that typically occurs during a project. The extent to which overlap is permitted is a function of task prerequisites and the availability of experienced skilled project resources. The AIM processes are identified on the left side of the diagram – their associated tasks are in alignment horizontally. (Figure 6)
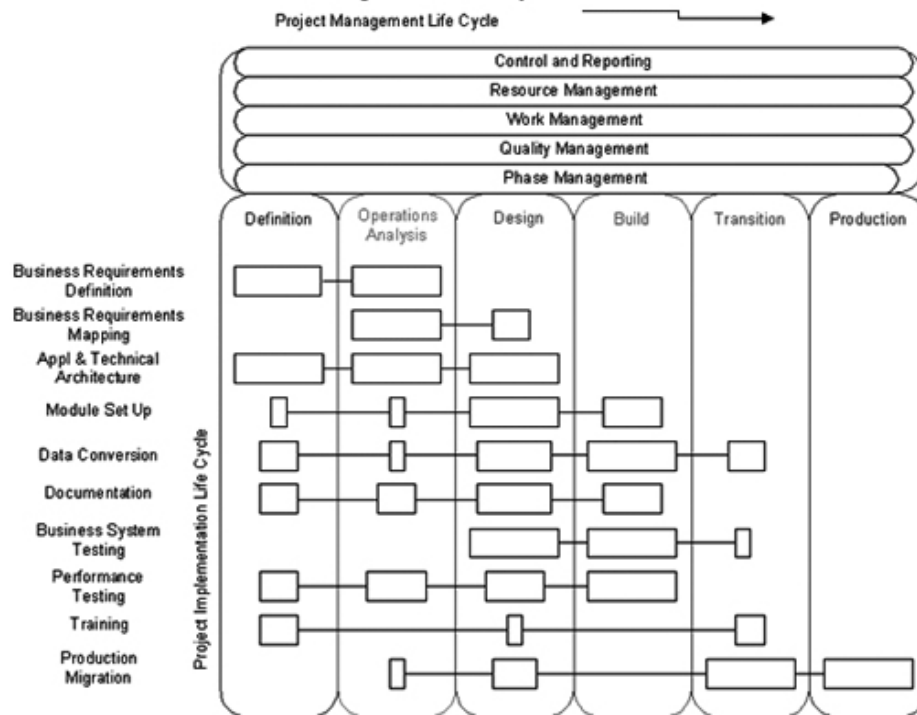
Figure 6 - Oracle AIM Diagram

2.12.2. Accelerated SAP

Accelerated SAP is a standard methodology for efficiently implementing and continually optimizing SAP software. ASAP supports the implementation of the R/3 System. It provides a wide range of tools of implementation project s- from project planning to the continual improvement of SAP System. The two key tools in ASAP are: The Implementation Assistant, which contains the ASAP Roadmap, and provides a structured framework for your implementation, optimization or upgrade project. The Question & Answer database (Q&Adb), which is utilized to set project scope and generate Business Blueprint using the SAP Reference Structure as a basis. (Accelerated SAP)

2.12.3. The Total Solution

Ernst & Young LLP have developed a systematic way of approaching systems reengineering called "The Total Solution". The Total Solution approach has five components:

The Value Proposition: The key before any process can begin is to make sure it makes sound business sense. Investment justification; analyzing objective fulfillment and determination of decision making framework, project milestones and deliverables are performed in value proposition.

Reality Check: Since many people oppose change, it's something that needs to be anticipated. Status quo is easy but change is not. Analysis of organizational readiness, consideration of possible hidden agendas and management' expectations are performed. With the help of this component, adjusting the implementation approach and avoiding a possibility that the change does not match the client's reality can be possible.

Aligned Approach: Even if change is discomforting for some, it is easier to accept if progress is visible. In this approach, the following tasks are performed: evaluating alternatives to a comprehensive reengineering project; crafting a "best-fit" approach that allows the implementation to proceed in well-defined modules; communicating expected results to management and keeping communication throughout the project so no surprises surface at the end. This approach helps keep the entire project on time, on budget and on management's agenda for success.

Success Dimension: The key to any project's success is having the right mix of people, skills, methods and management. E&Y team includes people with skills in

process management, change management, knowledge management, and industry skills. Teamwork is very important to determine the project's success.

Delivering Value: A project that does not show measurable results throughout the process is going to flounder. People will lose enthusiasm and the expectations of a new way of doing business become just another broken promise.

E&Y always makes sure that every project pays continuous "value dividends" all along the way and helps to minimize the risk of change.

2.12.4. The Fast Track Workplan

No matter if your business objective involves global reengineering, process improvement or software replacement, Deloitte & Touche Consulting Group/ICS Fast Track implementation methodology is developed to enhance and accelerate ERP software implementations. The five phase Fast Track Workplan with its specific activities help achieve a rapid high-quality business transformation.

Scoping and Planning: Project definition and scope. Project planning is initiated.

Visioning and Targeting: Needs assessment. Vision and targets identified. AS-IS modeling.

Redesign: TO-BE Modeling. Software design and development.

Configuration: Software development. Integration test planning.

Testing and Delivery: Integration testing. Business and system delivery.

Designed to reflect and integrate decisions regarding business redesign, organizational change and performance, training, process and systems integrity, client/server technologies and technical architecture. Fast Track identifies five areas

(group) as an individual thread to be woven into a cohesive fabric through its five phase work plan. The areas and a list of the functions performed are as follows:

Project Management (Project organization, risk management, planning, monitoring, communications, budgeting, staffing, quality assurance).

Information Technology Architecture (Hardware and network selection, procurement, installation, operations, software design, development, installation).

Process and Systems Integrity (Security, audit control).

Change Leadership (Leadership, commitment, organizations design, change, readiness, policies and procedures, performance measurements).

Training and Documentation (Needs assessment, training design and delivery for project team, management, end-users, operations, and helpdesk. Scripting of end-user and operations documentation).

CHAPTER 3

CASE PROJECT

In this section, an Oracle ERP Implementation Project, which I personally participated as a core project member, will be studied in order to analyze a real life application.

3.1. Information about Implementation

Company X is one of the biggest firms at the Turkish Defense Industry. Operating in the defense industry and cooperating with world leading companies force Company X to have some characteristics:

Performing several technology projects at the same time: Company X participates in several projects at the same time either as main-contractor or a sub-contractor. In both case, a severe project planning capability comes ahead. Tens of million-dollars-budgeted projects should be completed successfully; otherwise huge compensations should be faced. Moreover, failing or creating problems in the multinational projects reduces the chance of participation in following ones.

Applying advanced quality systems: Operating in high technology defense industry, forces the companies having error-free production systems and products. So-called "fatal-critic" productions are so intolerant towards faults that one of the best situations you can live is "landing of unexploded missiles on a non-occupied

region" that US experienced in the recent Iraq War. However, at that event, just the economic loss was over a million dollar for the value of the missiles.

Controlling all functional systems consistently: Missile production business has a significant characteristic in terms of control. Missiles are composed of relatively few but non-standard materials than other production goods. One or two hundred valuable materials are manufactured and integrated in the production plant. Most of the parts are product specific or hazardous. Therefore, warehousing and transportation systems are significantly different than the "systematically accepted" standard production systems. Company X generally utilizes bulk transportation, and carry huge amounts of material inventory (about 30-40 million dollars) and finished good inventory (about 50-60 million dollars). Considering the material values, inventory holding and transportation costs, Company X has to manage a production system composed of Class A items of a typical ABC inventory management system. All of them are valuable and all of them are critical. Therefore, all of the material movements, scraps, assemblies, related account operations, purchases, sales, outsourcing activities should be monitored, reported and controlled in detail.

Having strict security policy: Working in a critical defense industry, Company X has to have a strict security policy. Operating in a high technology environment, Company X is so sensitive about the knowledge security that even the staff has very limited information about the projects they are working on, nothing about the others. Moreover, the outsourced firms do not know what they are working on, although they have military production permissions.

Utilizing various production types at the same time: Company X has different types of production systems. Assembly lines for end products, numerically

controlled machines for physical processing (turning, milling etc.) and process type production systems for propellants, isolators etc. Adding these systems, Company X utilizes both batch and job shop production policy applications. Mass production level can be taken ignorable.

Considering the information stated about the characteristics of Company X, ERP Implementation Process of Company X was a challenging experience that involves complexity, systematic contradictions and lack of similar experience. In order to clarify that complexity, systematic contradictions and lack of similar experience, it would be better to analyze important decision points of the implementation:

Determining ERP Requirement:

For determining ERP Requirement decision, the following question should be answered: "Will the ERP be implemented or not?"

In order to decide on implementing or not implementing ERP dilemma, the basic criteria are costs and benefits of the ERP implementation. While comparing costs and benefits of ERP, quantifying the costs and benefits of the ERP implementation becomes a key point for a rational decision. Though cost figures are slightly quantifiable and foreseeable using the previous experiences, benefits are so company-dependent and time-dependent that even their presence is a question mark rather than their quantifiable magnitude. Quantifying process improvements or benefits of ERP implementation, requires a detailed AS-IS model which figures out the ongoing business processes and TO-BE model which includes the details of the planned ERP-aided business processes. Determining the negative and positive differences and monetary value of these net benefit, gives a rough idea for utilizing investment analyses such as rate of return..

Every company can operate with their ongoing business processes, otherwise they would not survive. Using paperwork, telephones, in-house developed computer programs etc., a level of inefficiency and non-systematic errors can be acceptable for all the companies. Adding easiness of working in a stable environment and resistance to change, claiming a requirement for millions-dollar worth ERP system should be considered as a brave attempt. Before ERP implementation, Company X has no problem with its ongoing processes. At the foundation years, processes were transferred from a well-running US business partner, and common belief was that "This is the only way to do this job." Since the revenues were high, growth in the workload and new projects were seemed as new employment requirements. In some years, the company had doubled the number of its personnel. After the projects ended, the related staff has been shifted to newer projects. ERP requirement idea arouse from a future projection workout of the Production Planning Department. Company X was planning to start enormous projects that will multiply the operational workload more than ten times within few years. Physical requirements would have been thought within these projects, but information infrastructure had not seemed to manage to handle this workload. Operational activities would have collapsed, if they had not been reengineered. Company X was determined to posses an integrated information infrastructure. The first idea was to develop a Custom-Built System, since the company has special processes to operate. Nevertheless, Company X has in-house software development experience and knows an experienced and high quality software group was a must to develop and maintain such a big software system; but existing IT group was not enough for that. The final decision was to obtain a software solutions business partner to utilize its experience,

maintaining service and technological capabilities. One of the standard ERP packages would be implemented.

Selecting Vendor:

Having several and hardly differentiable alternatives, selecting a vendor requires a methodological decision making approach to come up with a rational and healthy choice. In addition to that, evaluation of ERP packages is done by a collection of subjective evaluations of the selecting committee members. Eliminating the fuzziness of the personal ideas and constructing a comparative baseline to handle completely different aspects of ERP packages are keys for rational decision-making. Multi-objective decision-making can be a base to come up with a suitable methodology. Determining the criteria to choose the proper ERP software solution and weighting these criteria according to their importance may construct a decision equation. These criteria should be as detailed as possible.

i. Criteria Weighting

W_i : weight of ith criterion (e.g. capability of handling inventory batches, cost of the ERP software, cost of consultancy service, having similar implementation experience, etc.)

As the number and the details of these criteria increase, the decision-making can be performed more precisely. Generally, companies prepare a Request for Proposal (RFP) documents in order to organize these criteria. Since the companies have limited knowledge about the characteristics of the ERP solutions, a written reply is a must to avoid possible misunderstandings during the application. After

determining the criteria and their importance levels among the others by weighting, an evaluation scheme should be prepared for the selection committee members. Scaling the subjective evaluations of the committee members prepares a mathematical background for the decision and averaging the replies from the selection group members determines the level of fulfillment for each criterion.

ii. Scaling Evaluations of the Selection Committee Members

E_{ij} : evaluation of j_{th} committee member for the fulfillment of the i_{th} criterion.

The evaluations can be made according to a scale (e.g. scaling of fulfillment can be performed as 0-Not Applicable 1- Minor matches … 5- Fulfillment) As the fulfillment to the criterion is a subjective evaluation of each committee member, keeping the number of levels for the answers as few as possible seems favorable for rating. Otherwise, committee members may not give meaningful and precise answers; such as percentage of fulfillment for the handling inventory batches.

iii. Determining Level of Fulfillment

LOF_i : level of fulfillment for the i_{th} criterion.

n : number of committee members

$$LOF_i = \frac{\sum_{j=1}^{n} E_{ij}}{n}$$

After determining the level of fulfillment for each criterion, the decision equation can be set up as follows:

iv. Decision Equation

Z : Multi-objective decision making equations.

$$Z = \sum LOF_i.W_i$$

Utilizing such a disciplined decision making methodology is based on the equal contribution of the selecting committee members. It requires a strong understanding of ERP implementation, capability of determining company requirements and a certain level of TO-BE model details. Considering the pre-implementation preparation requirements, a strong and unbiased consultancy service is required for the vendor selection process.

In Company X's ERP implementation project, vendor selection process was one of the toughest decision points. A group of people, composed of different departments' members, were assigned to work on that issue. Several company visits were made, independent group evaluations were read and group discussions were organized. After three years (not an uninterrupted work), vendor selection group determined three finalists: SAP, Oracle and Bahn ERP Systems. Project group's criteria were functional capabilities, technological infrastructure, consultancy services and cost. According to vendor selection group: SAP was strong in financial functions, Oracle was strong in technological infrastructure and Bahn was strong in manufacturing functions. However, the final decision was not given according to the methodology mentioned above. The selection group wrote a report to the board of Company X and sequenced selection list was SAP, Oracle and Bahn, respectively. The final decision was Oracle.

Establishing Project Team:

Three years long vendor selection process taught Company X a lot about ERP implementation. One of the key success factors of the successful implementation was establishing a strong project team. In ERP implementation surveys, the success rate had been too low and in most of these failures, a small group of people in the companies was taking the responsibility of ERP implementation. These small groups generally had problems with detailed processes of other departments and had limited capability of analyzing the possible consequences of decisions in practice. Company X established a project group of 13 fully assigned white collars from different departments. The whole group was planned to work together to analyze the processes from different points of view at the same time. Although, this project group had experts of current business processes to determine minor changes in the company processes, in order to discuss and decide on major (or interdepartmental) issues, a supervisors group was established at the management level. The project group had to discuss on the details of the processes and prepare proposals for modifications in the major issues. Thus, major issues could be discussed with the supervisors with necessary background information and anti-theses. With the help of that two-layered and well-populated project group model, changes could be analyzed in detail and major ones could be performed. The other important success factor was the availability of experienced consultancy. During the entire project, Oracle Functional and Technical Consultants were working together with the project group. At the beginning of the project, they were utilized to teach functional details of the ERP package; and then to help the project team to find out

solutions for complex problems utilizing past experiences of both themselves as well as the Oracle company.

Determining the Implementation Methodology and the Project Plan:

Actually, determining implementation methodology was not an actual decision point. Oracle Corporation offers two choices for the implementation, and does not accept any other method. The claim was that "these methodologies are results of years' experience". The choices were standard "Oracle Implementation Methodology" and "Fast Track Option". Fast Track Option was more adequate for single to few module implementations; therefore implementing an ERP system required Oracle Application Implementation Methodology. Modules will be discussed in the next section. The ERP Project was divided into two major parts for project planning. The first part was the group of financial modules. Due to legal requirements, financial modules were planned to "go live" at the beginning of year, 2001. The activities for financial modules started at April 2000. The second group was the manufacturing modules. That part was planned between June 12th 2000 and March 1st 2001. The reason to split the project into two parts was the obligation of starting the bookkeeping activities at the beginning of a fiscal year and time requirement for implementing the manufacturing modules. Since the financial functions are highly standard, time requirement was less. That decision caused some advantages and disadvantages.

The main problem occurred in the Cost Accounting Module. Although, the other financial modules have a certain degree of standardization, Company X had a very complicated and a unique cost accounting system. All of the material, workforce, outsourcing, purchasing and sales activities had been constantly monitored and

reported to the top management. Even the half hour spent for cleaning by a worker was followed in detail. That time gap between financial and manufacturing modules implementation caused problems for Cost Accounting Processes. Cost Accounting Department still has problems with the ERP systems, about regaining the departmental process capabilities before the ERP implementation.

The time gap between implementing the groups of modules of the ERP system had one important advantage. The financial modules' implementation progressed of two or three implementation steps before the implementation of the manufacturing modules'. That meant recently acquired implementation experience for the Company and the project members. As the steps progressed, the followers became the witness of possible implementation problems, which occurred in financial modules. Therefore, manufacturing module implementation group was more conscious about the important tasks of the implementation steps.

Determining Modules to Implement:

As mentioned before, Company X had no problem with the ongoing business processes before the ERP implementation. The reason for implementation was the idea of possessing an integrated information infrastructure for the future projects. Therefore, a uniform software environment can be set by implementing all modules of the ERP package. As Company X does not have a sales or distribution system in general terms, Sales Module was not purchased. The Project Planning Modules has been purchased for possible use; however, since the project concept was completely different, it was not implemented. The details will be given in the following sections. The implemented modules are the following:

Financial Modules

➢ General Ledger, for legal bookkeeping activities

➢ Account Payables, for controlling payments

➢ Account Receivables, for controlling incomes

➢ Fixed Assets, for fixed asset financials

➢ Cost Accounting, for operation cost control

Manufacturing Modules

➢ Bill of Material, for defining material, resource and operational relations

➢ Work In Process, for controlling shop floor activities

➢ Engineering, for design and configuration management

➢ Planning, for production planning

➢ Inventory, for inventory transactions and planning

➢ Quality, for quality operations

➢ Purchasing, for purchasing activities

➢ Capacity Planning, for shop floor capacity planning

Determining Level of Customization:

Deciding on customization level is somewhat complicated than the decision on ERP implementation. Companies may decide a level of customization. At the boundaries of the decision alternatives, a company may implement a completely standard application or a completely custom-built application at two extremes. However, as a common application, companies implement a standard application and modify some of the activities as a customization. In ERP implementations, the decision to make is the percentage of the customization done in the ERP implementation. In this decision, in addition to the criteria of costs and benefits, a new criterion is

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introduced; namely risk. As the ERP packages are standard software solutions, they are developed with the years of software development and practical application experience. Therefore, inherent characteristics of software development, such as complexity, integrity etc. are eliminated to a significant amount. However, customizations can be considered as pure software development. Risks associated with the required development steps of the customization may cause significant problems during the implementation. Adding lack of support for maintenance and future updates of ERP vendors, companies may be forced to face with software development problems on their own. In the customization level decision, adding the costs and benefits of the customization level, risks should be considered.

Considering the specific characteristics of the company process and standard ERP package capabilities, level of customization was an important decision point for process mapping. Level of customization and business process reengineering were the two concepts to use in order to map company processes with the ERP functional capabilities. However, ERP packages do not supply any level of functional flexibility. Functions are designed according to best practices and the main aim is to create a standard in company processes. On the other hand, Company X has some inherent characteristics, most of which are vital to operate in its business environment. That contradiction has been solved at the beginning of the implementation project. ERP package customization was the worst thing to do, since Oracle Corporation expressed that they will not support any customizations during maintenance or in updates. This choice was a potential danger for the well-being and integrity of the information system. Embedded customized functions might be problematic for standard application and might turn out to be useless after

a future update. Moreover, processes taken from the best practices might be beneficial for the efficiency of company processes. On the contrary, some of the company processes could not be changed because of sector requirements.

The final decision was that, all possible processes would be reengineered to utilize flexible fields available for extra data requirement, the remaining processes would be classified as critical and uncritical, so that the uncritical ones are to be eliminated and critical processes to be covered outside the ERP system. This decision played a key role for the success of the ERP implementation project, since the processes that could not be mapped are excluded from the ERP; however, this decision also harmed the integrity of the information system.

Defining Projects in Oracle ERP:

As mentioned in the previous sections, Company X handles several standalone projects in the production environment. For each project, most of the activities run independently within the company. Only purchasing and legal booking activities are performed in common. Among the projects, common material usage was rare. Moreover, some security restrictions should have been under consideration. Project information should have been available for only the related project staff. The Oracle ERP has a project definition, but it was just for grouping some purchasing, planning activities. After long discussions and analyses; projects are modeled as different production facilities in the ERP system. They were all supported by individual ERP modules, while sharing the purchasing and legal bookkeeping modules. Common material usage among projects was managed manually. Especially inventory planning and production planning activities of these common materials was performed outside the ERP system.

Monitoring Batches in Oracle ERP:

One of the important issues discussed was the batch concept which was used extensively by Company X's production system. Batch concept was available in the ERP inventory processes, but not in the Work in Process operations. Adding that Company X's production system had been based on batches flowing through the production lines. The situation was the same for purchasing and related quality control operations. Exclusion of batch concept meant early failure of the manufacturing modules. The problem was solved by the use of unused record field during transactions. Users would enter the related batch number during transactions; then control and monitoring activities will be held by advanced grouping queries. That design caused several impractical consequences in usage, however succeeded with advanced education of end users and severe systematic discipline.

Modeling Legal and Ongoing Accounting System in ERP:

Legal accounting system did not cause significant problems for the company. Since the legal accounting systems are country dependent, ERP vendors are developing localized accounting systems to make their ERP system purchasable. However, Oracle does not have too much experience in Turkey and some technical support problems were experienced. The most problematic subject was Cost Accounting Activities. Detailed cost accounting activities means more control of management over the company operations. In addition to the ongoing cost accounting activities were performed on MS Excel tables. So much calculation flexibility, manual data entry and fast reporting were the strongest points of the Cost Accounting Department. They were directly reporting to the management and management was too strict about reports, formats and data collection methodologies. Customization

was utilized in that module. Instead of changing the functionalities and data structure of ERP system, custom data storage and functionality addendums were preferred in the customization. ERP tables had been utilized for data consistency, but required data would be kept in separate tables and functions would be run isolated. As an example, actual shift records of the employees were taken, controlled, processed and reported in one of the customized systems. Nothing was available about that subject in the standard ERP package. Adding that ERP reporting utility was not so flexible, data export and MS Excel utilization continued. Nonetheless, several automatic cost reports had been generated in the ERP system. The Cost Accounting Module still has problems in supporting the processes.

Modeling Strict Quality Applications in ERP:

In the ERP implementation process, one of the unsuccessful implementation areas was quality applications. The major reason was the complexity of Company X's quality system. Since the errors were intolerable, the related department personnel were sensitive about the quality processes. Actually, quality control was similar to ERP processes. Control points, sample tests, scraps, reworks were available in the package. The problem arouse from error handling mechanisms. ERP quality system processes were designed to eliminate the unacceptable parts and discard from the system. However, since the materials are too expensive in Company X, the unacceptable parts are analyzed in detail and faced unique operations on them according to the type of faults. Holding in the inventory, transferring, costing showed varying characteristic for unique faults. Therefore, most of the quality operations were excluded in the implementation. One important point is that Oracle

experienced its first Quality Module implementation in Turkey at that ERP project. Lack of consultancy experience has a level of impact at the process exclusions.

Modeling Process Manufacturing Systems in ERP:

One of the important deficiencies in Oracle ERP package was process manufacturing capability. Productions of chemicals and related processes could not be modeled in the ERP system. They were all excluded from the system except some material batch reservations in the inventories.

Defining Users:

A fundamental contradiction has been faced during user definitions. Conceptually, integrated information systems are developed for company wide information sharing, direct access to original data and fast and flexible reporting. A big crisis arouse in user definitions. The problem was that ERP system could not supply project level access. A user which had access to the inventory information could have access to all projects' inventory information. That was unacceptable for company due to its strict security policy. In order to solve that problem, only a few personnel was decided to be authorized to access information directly and the others were informed by the help of regular reports. That situation can be considered as as a conflict with idea of ERP systems.

3.2.   Problems & Related Solutions

Problems with technical capabilities of the ERP Package

Discussing on the technical capabilities of an ERP package might be unfair for the vendors. They are developing a standard product and the characteristics of this

product are compared with completely independent developed production systems and their requirements. Here, their level of flexibility can be discussed. Considering lack of support of maintenance and update for customized parts of the ERP systems, flexibility of standard ERP packages seems the only way for varying production facilities using the same ERP system. Suppose your business rival, running on the same sector, implemented the same ERP package. Ignoring the product characteristics and ERP flexibility, all of the advantages you have before from your unique business processes would have diminished.

In the case project, flexibility performance of the Oracle ERP package was disappointing. Lots of important company processes were excluded and some critical ones could be applied using extraordinary creativity and with a certain amount of loss in practical usage. Unused data fields were utilized and advanced reporting tools were required for basic reports.

Problems about communication among project members

Communication among project members is one of the important success factors in implementation projects. Under the overwhelming documentation workload and strict due date stress, in Company X's ERP implementation project, project members had communication problems. Even though the members worked in the same project room and performed frequent meetings, coordination problems have aroused several times. Conflicting designs, misunderstandings were frequent occasions. Once, a personal fault cost three group days (app. 300 man-hours) at the data conversion step of implementation. Fortunately, a national holiday prevented latency on the "go live" date. In order to avoid communication failures among team members, addition to meetings, frequent short briefings about ongoing personal

tasks could have been beneficial. A presentation has been organized at the future process model stage of the project and lots of contradictions, misunderstandings were figured out and corrected.

Problems with Consultant Company

The main problem faced with the consultant company was about practical application of Oracle Application Implementation Methodology (AIM). The Oracle AIM is a methodology based on Classical Life Cycle Software Development Model. The first step is determining Current Business Plan which corresponds to analysis in the Life Cycle Model. Second and third steps are Developing Future Business Plan and Mapping that are design steps. Fourth step Testing has the same name in both methodology and development model. The User Education and Data Conversion Steps have no impact on the implementation details before going live. There was no theoretical problem, but there were some differences in the application. Documentation plays a key role for going through the implementation steps successfully. Following the current business practices through the implementation and avoiding possible mismatches can be performed via documentation. First of all, similar explanations above have never been stated. Adding that, documentations were expressed as the main aim of the implementation steps and due dates obligations was more important than the continuity of the current business practices through the implementation. From personal point of view, that has two reasons: the first one is their project plan conformity requirement towards the Oracle Corporation: and the second is awareness of that functional capabilities of the ERP package were far away to fulfill the requirements of the current business plan. A classical life cycle model without any turns leads to more

ERP like business processes and less excluded processes on documentation. The result was unhealthy documentation, loss of thousands of man-hours and unnecessary due date stress. Utilizing a much conscious documentation might have led to valuable records of the implementation.

Problems with company processes and resistance to change

As mentioned in the previous sections, Company X had had well defined business processes taken from a well-running US business partner before the implementation. The processes were so stable that only manufacturing operation had been changed using a documentation workflow passing through tens of approvals within weeks. Material replenishments had taken less time than the approval of the requisitions. Document losses were frequent. During the implementation process, several meetings were organized in order to eliminate excessive approvals and succeeded to eliminate some of the managerial approvals. Unfortunately, developments were too limited in the workflow periods, although we manage to reduce significant amounts at operational times of documentations.

Problems arouse after Implementation

The most significant problems after going live was some mismatched process exceptions. In implementation period, project group had tried to simulate as many exceptions, coincidences, possibilities etc considering mismatches. With the contribution of unhealthy documentation, some mismatching requirements have been faced. All of these problems have been solved with an amount of detailed analysis, design, testing and implementation.

3.3. Evaluation of the Implementation

In term of project targets, Company X's implementation project was a complete success. Obeying the two different "go live" dates for both financial modules and manufacturing modules was succeeded, and budget constraints were not exceeded. According to the decisions taken before and during the implementation project, all planned tasks were successfully completed. The initiative target, getting ready for the much bigger projects in terms of information infrastructure, was achieved. National IT magazines offered interviews to tell the success story and Oracle organized several company visits for its new potential customers.

In terms of company processes, the implementation can be considered as successful. Most of the company processes are collected in the ERP system. Data correctness and consistency is improved. Operational discipline has been established in lots of the processes. As an example, negative inventory level occasions vanished.

In order to gather personnel opinion about the ERP implementation in Company X, a group of open-ended questions have been prepared and orally asked to the project group. At first, a questionnaire has been planned with close ended questions. That would be dictating and statistically meaningless, considering the number of people in the working group. 12 employees answered the questions. 10 of them were in the ERP implementation group, 2 of them were not in the project group but they were followed the ERP Implementation process continuously. The questions and answers are as follows:

➤ What is your opinion about the results of the ERP implementation?

9 employees out of 12 agreed on the project success in terms of project targets. One employee replied that the ERP implementation was not required and all the cost was a loss. He claimed that previous system was more suitable for the company requirements. 11 replies were about the functional capability disappointment of the Oracle ERP system. 1 employee replied that he was expecting that functional constraints.

Answers are generally positive for that question. Obeying the time and budget constraints is general reasoning. There are some negative answers from accounting and quality departments. They are claiming, ERP caused extra problems and harms the flexibility at their calculations. However, they are happy about decrease in the faults of operational activities. Most of the project members agreed that they are disappointed with the functional capabilities of the ERP system.

➢ Would you prefer working with another business partner?

4 employees expressed their SAP preference. Other employees said that there would be no significant change with another partner.

Accounting departments consistently claimed that SAP alternative would be significantly better, because of better functional capabilities. Other departments generally think that there would be no change.

➢ What was the most problematic issue you experienced during the implementation?

That question had various replies from the work group. Accounting personnel pointed out the deficiencies in the localization program. There are different answers from the other departments. From the problem occurred in the data conversion step

to the documentation, several answers were given. They are discussed in the previous section.

> What will be the most beneficial aspect of ERP for Company X?

10 out of 12 replied in the direction of control and discipline. 2 of the answers were about the readiness for the future projects.

These answers were important for the evaluation of the implementation process, as the main reason to start the ERP project was to be prepared for the future projects. Above, the answers could be seemed different, but considering the control capability of the ERP, directly supplies Company X handle the near future projects. It is interesting that nobody replied as efficient processes. I think that in order to signify the process improvements, the processes should have been quantified and some improvement targets could have been set.

> What are the personal benefits of participation in an ERP implementation project?

The most common answer is that it was a good experience for their future career. Some of them find it beneficial to learn the other company processes. One of the members found it negative rather than beneficial for preventing herself from her regular work.

CHAPTER 4

CONCLUSION

Enterprise Resource Planning Systems are one of the most complex information systems available in recent years. Maybe the most comprehensive off-the-shelf program ever developed. Companies spent millions of dollars to implement ERP systems at their companies. However implementation success rate is so low that just implementation of a standard software package created a market worth's billions of dollars. Considering the activities performed in the implementation process, information technology transfer, business process reengineering, changes in business culture and business role shifts occurred either together or separately or in series. These activities indicate both the importance and the complexity of the ERP implementations.

Low implementation success rates, force the companies develop alternatives of implementation. Some of them develop their company specific ERP systems, some of them prefer standard off-the-shelf program and some of them preferred a mixed as hybrid systems. Implementation sizes were also varying. Some of the companies try to implement the whole systems at once; some of them decide stage-wise implementation. However, considering the implementation as a standalone process and focusing on these activities is one of the important faults. Limiting the process development within the implementation activities is one the important traps on the way to failure. Companies recognized those pre-implementation preparations; ERP

package selection, determining project targets, foundation of project group; are as important as implementation performance, maybe more. As well as pre-implementation preparations, post-implementation developments play a key role for the continuity of further improvements, better utilization of ERP and correcting possible erroneous points determined during or after the implementation process. Adding that, positive effects of ERP implementations appear at least one year after the "go live" date, continuous improvements play a key role on the way to ERP success.

Although, some significant portion of ERP implementations are embedding off-the-shelf software packages into the company processes, the size and complexity force the companies and academics to perceive the implementations as a software development activity. Therefore, a methodological approach is an inevitable requirement for handling the entire ERP implementation process with previous and following activities. Widely accepted software developments models, such as Classical Life Cycle Model, Prototyping or Spiral Model, are offering a general notion for the solution; however, since these models do not reply specific needs of the companies, ERP vendors introduced "derived" methodologies for ERP implementations, such as Oracle AIM, ASAP etc.

Estimation is one of the important points that determine the success of ERP implementations. Estimating duration, workforce and support requirements effectively, avoids serious negative results in the implementations. Analyzing the

factors effecting the implementations, determining risk factors and possible problematic areas provide companies having rational and advantageous startups to the overwhelming implementation process.

Case project studied in this thesis was a professional personal experience. It was one of the largest ERP implementations performed in Turkey, in terms of functional width and complexity. Experiencing implementation of a nearly complete (sales and project planning modules were missing) ERP system, provided a wider point of view while experiencing deeper functional details as a project group member. In my opinion, working at Company X's specific characteristics, such as flexible and varying production systems, tough quality policies, project oriented organization, strict security and operational control requirements; mapping them into standard ERP processes was challenging and educative not only for the company staff but also for the consultants. Investigating the consequences of major or minor process changes for the company, facing with strong resistance to change even in the project group, committing interdepartmental challenges for power at the definition of new business roles has been completing the setup for an ERP experience, which was far beyond the expectations before.

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