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THE NATURE OF THE RELATIONSHIP BETWEEN TOP MANAGEMENT SUPPORT, EFFECTIVE PROJECT MANAGEMENT AND SUCCESS LEVEL OF ERP PROJECTS : THE CASE OF PHARMACEUTICAL SECTOR IN TURKEY

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LIST OF ABBREVETIONS

ANOVA	Analysis of Variances
Asst.	Assistant
APICS	American Production and Inventory Control Society
CIM	Computer Integrated Manufacturing
CSF	Critical Success Factor
CV	Curriculum Vitae
Dr.	Doctor
e.g.	for example
Ed. (ed.)	Editor
ERP	Enterprise Resource Planning
et al.	and others; and elsewhere
etc.	et cetera
i.e.	that is
MBA	Master of Business Administration
MNC	Multinational Company
MRP	Material Requirements Planning
MRP II	Manufacturing Resource Planning
SCM	Supply Chain Management
Sig.	Significance
Prof.	Professor
Vol	Volume

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ABSTRACT

The implementation of enterprise resource planning (ERP) has been gaining much importance especially in developed countries since 1990's. The main purpose of this study is to examine the nature of the relationship between top management support, effective project management and the success level of ERP implementations in Turkish branches of multinational pharmaceutical companies.

The study, which was designed for examining the main organizational factors of ERP projects, was a pioneer one in Turkey. Since the pharmaceutical sector was one of the economic sectors where ERP projects having been implemented more frequently, the research data were gathered from 9 Turkish branches of pharmaceutical MNC's which have already implemented at least one of the four major ERP software namely SAP, PeopleSoft, Baan and Oracle. The total number of the members of 9 organizations was 45 individuals who were involved in the implementation of ERP projects, were all included in the sample.

In terms of the measurement of the success level of ERP projects, the variables of allocation of well-skilled employees and supporting ERP implementation to come over implementation barriers were the most powerful variables according to the results of the statistical analyses performed in this study. The direct participation of top management in implementation activities and top management support for project management in conflict resolution made the strongest contribution on effective project management. Furthermore, two main attributes of effective project management, establishment of effective communication and project champion which were able to explain almost two third of the variance in success level of ERP projects, deserved the attention in relation to the application of modern managerial mindset.

The study indicated that ERP projects carried out in Turkish branches of multinational pharmaceutical companies could be more effective if the senior managers of organizations would provide a sustainable support during the implementation process, and project managers were involved as project champions.

ÖZET

Kurumsal kaynak planlaması (ERP) sistemlerinin implementasyonu 1990'lı yıllardan beri, özellikle gelişmiş ülkelerde, giderek artan bir öneme sahiptir. Bu çalışmanın temel amacı çok uluslu ilaç şirketlerinin Türkiye'deki işletmelerinde, üst yönetim desteği, etkin proje yönetimi ve ERP implementasyon projesinin başarı seviyesi arasındaki ilişkiyi incelemektir.

ERP projelerindeki ana organizasyonel faktörleri incelemek için tasarlanan bu çalışma, Türkiye'de bu alanda öncü olma özelliğine sahiptir. İlaç sektörü, ERP sistemlerinin sıklıkla uyarlandığı başlıca sektörlerden birisi olması nedeniyle, araştırma için gerekli veri, Türkiye'de faaliyet gösteren ve SAP, Oracle, PeopleSoft ve Baan ERP sistemlerinden birinin implementasyonunu tamamlamış, 9 çok uluslu ilaç şirketinden toplanmıştır. Bu şirketlerde ERP implementasyon projelerinde görev almış toplam 45 birey bu çalışmanın örneklemi içinde yer almıştır.

Bu çalışmada uygulanan istatiksel analizlerin sonuçlarına göre iyi donanımlı çalışanların projelerde yer almalarını sağlamak ve ERP projelerini şirket içerisinde gelişen dirençlere karşı desteklemek, ERP implementasyon projelerinin başarı seviyesindeki değişikliğe en fazla etki eden değişkenlerdir. Üst yönetimin projeye doğrudan katılımı ve proje yönetimini anlaşmazlıkların çözümlenmesinde desteklemesi etkin proje yönetimine en güçlü etkiyi yapmaktadır. Buna ek olarak, etkin proje yönetiminin iki önemli elemanı etkin iletişimin kurulması ve proje şampiyonun varlığı, ERP projelerin başarı seviyesindeki değişikliğin üçte ikisini açıklamakta olup modern yönetim tekniklerinin uygulanması ile ilgili olarak dikkat çekmektedir.

Bu çalışma, çok uluslu ilaç şirketlerinin Türkiye'deki işletmelerinde gerçekleştirilen ERP implementasyon projelerinin, üst yönetimin implementasyon müddetince sürdürülebilir destek sağlaması ve proje yöneticilerinin implementasyona proje şampiyonu olarak katılmaları durumunda, daha başarılı olduğunu göstermiştir.

INTRODUCTION

Background

To cope with increased global competition and to adapt rapidly changing business world, companies need to gather and process information easily and fast. Such a requirement forced companies to utilize information systems designed for the whole organization. After 1990s, implementation and usage of ERP (Enterprise Resource Planning) became the most common and significant part of corporate usage of information systems in global business world (Davenport,1998).

ERP (Enterprise Resource Planning) systems are integrated software packages composed of several modules, as human resources, sales, finance and production, providing cross-organization integration of data through embedded business processes (Esteves et al., 2001). Since ERP systems, as off-the-shelf solutions for business integration problems, most of the large, multinational companies replaced their internal software systems with ERP packages during 1990s. Even within small and medium size companies, implementing ERP systems is a very popular information technology strategy.

ERP systems are called off-the-shelf solutions, such systems are needed to be adapted – in general called implemented - to the corporation, to be used and utilized within the corporation. Implementing ERP systems are not just installing the software to the mainserver of the corporation, but projects which requires huge budgets, expertise and time (Davenport 1998). The global figures about success of ERP implementation projects illustrates that 90 percent of the projects are late or over budget (Martin, 1998) and the success rate of the projects is just 33 % (Zhang et al., 2002). Failure in ERP projects may even drive companies into bankruptcy (Davenport,1998).

The dissappointing results of relevant statistics (Martin, 1998; Zhang et al., 2002) about success rates of ERP Implementation Projects and disencouraging stories (i.e. Fox Meyer Bankruptcy (Kalatoka et al. ,2000)) about these projects made researchers to study about

critical success factors of ERP Implementations. Studies performed on critical success factors stated that not the reasons behind the complex technical nature of the ERP Systems are the critical factors for success, but the organizational and managerial factors are major factors affecting ERP implementation success (Davenport, 1998; Gupta 2000;Zhang et al.,2002).

Some leading researchers (Gupta, 2000; Ewushi-Mensah, 1997; Nah et al., 2001) studied on critical success factors stated that top management support is a key success factor for ERP implementation projects. Top management should support ERP implementations in terms of providing leadership and necessary resources to the project (Zhang et al., 2002).

Effective project management is also essential for a successful implementation. It is known that although some projects fail because of technical reasons, most project failures are caused by people who ignore the principles of good project management (Jurison, 1999). ERP projects generally require huge budgets, relatively wide time frames and involvement of diversified parties within the organization. Therefore companies should have an effective project management strategy to control the implementation process, avoiding overrun of budget and ensuring the implementation within time plan.

Even most of the researchers studied on critical success factors in ERP implementation projects included top management support and effective project management in their studies, there is a lack of the operationalization of these thoughts (Esteves et.al, 2001). Analyzing top management support and effective project management as success factors of ERP implementations are very important because of the lack in related literature in terms of practical studies and realization of critical success factors of ERP implementations.

Since ERP implemantations have been gaining importance in various economic sectors in Turkey, the main purpose of this study is to examine the concepts of 'top management support', 'effective project management', and the assessment of 'success level of ERP implementations' as well as the nature of relationship between these concepts in ERP implementation projects carried out in Turkish branches of multi-national pharmaceutical companies.

Significance of the study

This research intents to provide a better understanding of the concepts of 'top management support', 'effective project management' and 'success level of the projects' in ERP implementations and also the nature of the relationship between these concepts.

Since it is relatively a new field, it is my assumption that this study could make a significant contribution to related ERP implementation success factors literature by the measurement technique of success level of ERP projects and operationalization of the theoretical thoughts regarding the effect of top management support and effective project managements on success of ERP projects. The findings would be beneficial for the managers who think of planning an ERP implementation project.

The research covered a number of selected employees of Turkish branches of multinational pharmaceutical companies who already implemented ERP software products of SAP, Oracle, JDEdwards, PeopleSoft, which are considered as international major players of ERP packages (Chen, 2001).

The main disadventage of the research is the sample size. Since the research is conducted on the particular type of employees from the limited number of companies which satisfy the requirements of research focus, the sample size of the research is inevitably relatively small.

Organization of the study

The study consists of four chapters. In this introductory section the background of the problem, significance of the study and organization of the study were explained briefly.

Chapter I reviews the relevant literature on ERP, top management support in ERP implementation projects, effective project management in ERP projects, the concept of success of ERP implementation projects and integrated theoretical considerations.

Chapter II describes the methodology that will be utilized in the study, research questions and hypotheses, research design, survey procedures and statistical techniques to be employed in analyzing the data.

Chapter III covers the findings of the study, hypothesis testing and main interpretations.

Chapter IV consists of the discussion and conclusion. This section reinforces the previous chapters by presenting discussions, conclusions on the subject of ERP implementation and recommendations for the future research.

CHAPTER 1

LITERATUR REVIEW

1.1. What is ERP?

Even it can be said that there is a general perception on the subject of ERP, the discussions on the definition of the term ERP still go on among researchers. The general definiton of the term ERP is made by Davenport as; ERP is a software solution that adresses the enterprise needs taking the process view of an organization to meet the organizational goals tightly integrating all functions of an enterprise (Davenport, 1998)

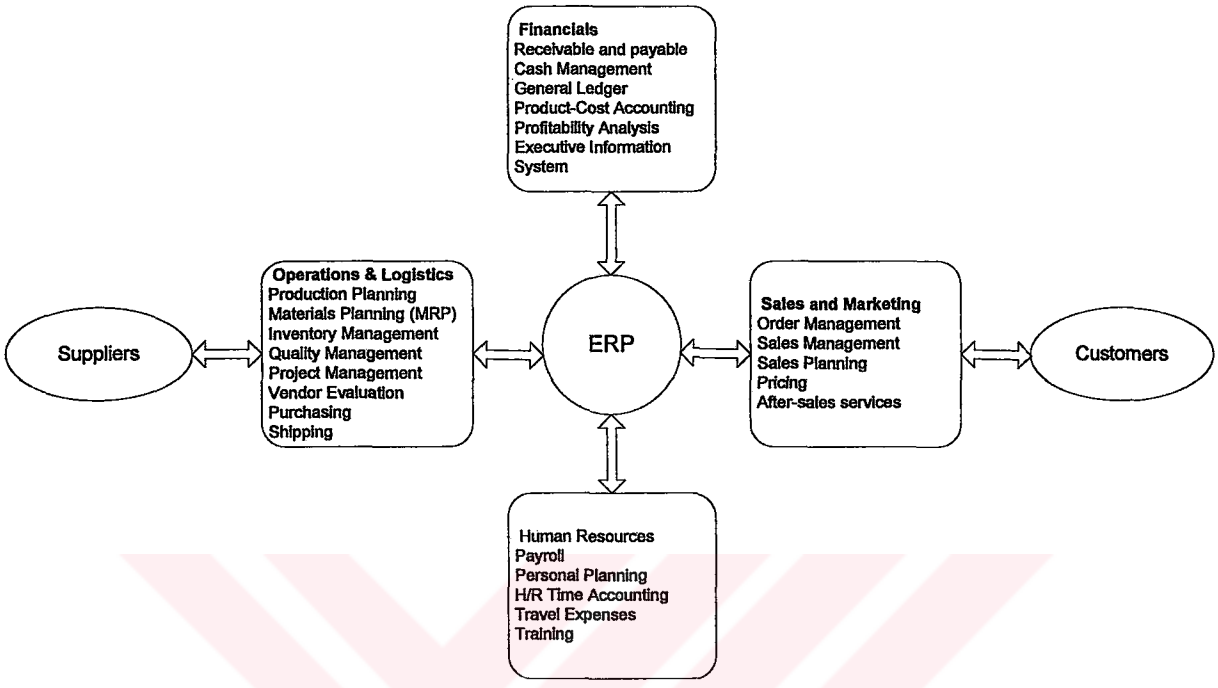
ERP is an enterprise-wide software solution designed to streamline the data flow between different functions in an organization. Moreover, ERP is an industry term for the broad set of activities supported by modular application software that assists a manufacturer or other businesses in managing the important parts of the business including production planning, purchasing, maintaining inventory, interacting with suppliers, providing customer service and tracking the orders (Lee et al., 2003).

Klaus, Rosemann and Gable asked the question 'what is ERP?' in their empirical study conducted in 2000 and they stated that ERP is a concept which can be viewed from three perspectives:

- ERP is a product in the form of computer software
- ERP can be seen as a development objective of mapping all processes and data of an enterprise into a comprehensive integrative structure
- ERP can be seen as the key element of an infrastructure that delivers a solution to business.

As it is stated above, ERP is a commodity, a product in the form of software, which is developed by ERP vendors for different companies of various sizes in different industries in all over the world with a generic and comprehensive content. Therefore, it is hard to characterise ERP simply by listing its functions. However, a general content and scope of ERP can be illustrated as follows:

Figure 1.1 An overview of ERP systems



(Chen, 2001)

ERP systems, as illustrated are designed to cover all major functions of companies. The core of ERP is actually a centralized comprehensive single database (Algeo and Barkmeyer, 2000). The database collects data from and feeds data into modular applications supporting virtually all of a company's business activities – across functions, business units, in all over the world. When a new information is entered in one place, related information is automatically updated (Davenport,1998).

For instance, when a sales representative enters a sales order to the ERP system, the system automatically checks the credit limit of the customer and inventory level of the item, and creates a pick list printed in the warehouse. Warehouse people make the shipment, and system automatically creates the invoice and delivery note in the language and currency of the customer. Journal entry is created for the sales transaction and posted to general ledger, invoice is recorded as a receivable due to payment day, the inventory level of the item is

updated, the commision figures for the sales representative is updated. More specifically, ERP performs nearly all information transaction within the company related to the sales activity. This feature of enabing enterprise integration makes ERP a necessity for the companies (Siou and Hong, 2003), which provides companies benefits in terms of productivity efficiency and speed (Davenport, 1998).

The main chracteristics of ERP systems can be summarized as:

- ERP Software is a generic software which is designed for the usage of companies (organizations) of various sizes and operating in different industries in all over the world. Therefore, ERP software is a highly configurable and customizable software.
- ERP is an application software, which differentiates from operating system softwares, database management softwares or middleware softwares. ERP software is a software with rich functionality, which covers core business functions of a company as procurement, inventory management, financials, human resources, production planning in an integrated manner. In addition to these ERP Software may have special functionality as patient management for hospitals, student administration at universities.
- The components of ERP software follow a process oriented view of enterprise, although they are all defined in different modules of the software. It ensures that typical business processes are supported in a seamless way across functions.
- ERP targets multiple industries with very different characteristics (Co existance of retail and manufacturing soluitons in one software). ERP software may either have the ability to support different industries in one solution or may offer pre-configured enterprise-individual solution (Special solution for only retail).
- ERP is designed for companies that act in various countires. Thus, ERP software includes solutions for different countries as, country specific accounting solutions, HR-payroll solutions, preformatted document types (i.e. delivery notes, invoices). The ability to handle multiple currencies in all transactions is also a mandatory feature.
- Frequency and repetition of the usage is also an important feature of ERP. ERP supports recurring business processes like procurement, sales order processing or payment processes and it is not focused on less structured, irregular processes like

marketing, product development or project management (Klaus et al., 2000; Hagman 2000; Davenport,1998).

ERP software can also be characterised in technical view as:

- ERP software has consistent graphical user interface across all application areas.
- ERP software has a client server architecture, seperating database, application and the presentation of the application (Graphical User Interface) in three layers.
- ERP software is 'open' in terms of selection of operating system software and hardware platforms. Typical ERP software can work on windows, UNIX, LINUX, etc.
- ERP software has a complex system administration tool, which is used for user administration, database configuration, performance measuring, etc. (Hagman, 2000).

1.2. Evolution of ERP

MRP (Material Requirements Planning), which is said to be the origin of ERP systems (Chung and Syndler,1999; Holland et al., 1999; Klaus et al., 2000), was actually the first off-the shelf business applications designed in late 1950s.(Klaus et al., 2000; Chung and Syndler, 1999).

Orlicky published his study which describes MRP, as an effective and modern method of inventoy management in 1975. In his researches, he stated that after second world war, in Europe, MRP was applied in some companies without computerized systems. In 1960s, computerized MRP systems are began to be used in U.S.

In 1970s, computerized MRP systems became very popular in US with APICS's (American Production and Inventory Control Society) supportive actions for MRP usage. APICS tried to convince people that MRP is a solution to integrate manufacturing processes of a company and an effective tool for communication and decision making. APICS stated the importance of management science and system analysis in optimizing MRP systems usage (Yegul, 2002).

During 1970s, MRP softwares were extended with further applications to support entire production planning and control cycle. This expanded approach was so fundamentally

different from the original concepts of MRP that Wight (1981) named the new systems as MRP II, which refers to 'Manufacturing Resource Planning'.

MRP II systems were designed in a way to include, resources, such as machinery capacity, personell and financials in planning process in manufacturing environments (Tanyas,1994). MRP II systems were also modular systems, which has different modules such as materials management module in which procurement and inventory management activities were managed, capacity management module, in which machine capacity control and management activities ware performed (Klaus et al., 2000).

In the 1980s, different technical areas of manufacturing environments about product development and production processes were also computerized as an extention of MRP II (Klaus et al., 2000). Different computer systems developed for these related functions which can be named as 'computer aided design', 'computer aided planning', 'computer aided quality assurance', e.t.c.. The entire conceptual framework for the integration of all managerial and technical functions of a company was named as Computer Aided Manufacturing (CIM) (Scheer,1994). In CIM projects of 1980s, main focus was the integration of data with an integrated database with information flow between different functions and also process modelling, which are the base of ERP philosophy.

In Early 1990s, need for integration of different applications used in companies and also new business processes needed to be included as human resources, created large, moduler, unique and intgrated softwares so called ERP (Enterprise Resource Planning). It is intended to improve resource planning by extending the scope of planning to include more of the supply chain than MRP II (Chen, 2001).

In 1990s, ERP systems became most important way of software usage in companies. SAP, German software company, which is the market leader, increased its total revenue from $ 500 million in 1992 to $3.3 billion in 1997, making it the fastest growing software company of the world. Major players of the market are SAP, Oracle and PeopleSoft, where total worldwide ERP expenditure is approximately $10 billion per year (Davenport, 1998). The ERP Market share of the major players is as illustrated in Table 1.1.

Table 1.1 Market Share Information of Global ERP Vendors

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

(Gartner Group 2003)

1.3. Some Examples of International ERP Projects

As it is explained; ERP systems are generic software systems, which should be implemented to the companies which the system will be used (Davenport 1998, Klaus et al., 2000). When the implementation is successful, then the companies benefit from ERP systems in many areas, such as improvements in inventory turnovers, delivery times, to have customer relations under control, to have a structered supply chain organization, etc (Mabert et al., 2001). Some famous examples about successful ERP projects can be listed as:

- One of the good examples of successful ERP implementations in the literature is the ERP implementation of Elf Atochem, which is a regional chemicals subsidiary of French company Elf Aquitine, established in North America. Elf Atochem implemented a well known ERP system successfully in 12 different business units successfully. After implementation, Customer satisfaction levels have increased. The fulfillment of customer orders could be done in only one call for 95 % percent of the orders, where the average was five calls before implementation. Inventory levels, receivables, labor and distribution have all been cut. Now the company expects the ERP system will reduce annual operation costs by tens of millions of dollars (Davenport, 1998). Another good example in the literature is the ERP implementation of Fujitsu Microelectronics of United States. After implementing an ERP system

successfully, Fujitsu brought its quotation cycle down by %90 from twenty days to two days. After the implementation rate of on-time deliveries increased from %60 to %85. Another important enhancement was in financial closing, where the total time for overall closing decreased from 10 Days to 5 Days with ERP implementation (Hayman, 2000).

- Another successful project which took place in literature is ERP implementation of Colgate – Palmolive of United Sates. After ERP implementation, no of overall data centers has been decreased from 75 to 2. Before implementation, Colgate used to take from 1 to 5 days to acquire an order and 1 to 2 days to process the order. After implementation of ERP, order acquisition and processing combined took 4 hours (Kalatoka et al., 2000).

- Besides success stories there are different failure stories about ERP implementations. In fact, the success rate of the ERP implementations is 0.33 (Martin, 1998). Therefore number of failures is much more than the success. Above some failures mentioned in literature are listed as:

- The most famous ERP implementation failure is the FoxMeyer Drugs, which ended with the bankruptcy of the company (Scott et al., 2000). FoxMeyer Drugs was one of the biggest pharmaceutical wholesalers of USA in 1993 before ERP implementation. In 1994 and 1995 ERP implementation project took place in the company. The project was unsuccessful and in 1996 FoxMeyer Drugs bankrupted. In 1998 the company management sued Andersen Consulting, the consulting company participated in the implementatation and SAP North America, the software vendor. Unsuccessful ERP project was the reason of Bankruptcy (Bulkeley,1996).

- Another example for failures is the ERP implementation of Dow Chemical. Dow chemical spent seven years and close half a billion dollars implementing a mainframe ERP system. After seven years effort, company management decided to throw the implemented system away and implement a new client server system (Davenport,1998).

- ERP implementation of Dell Computer is also a failure example. After two years of implementation, Dell decided that its system would not fit its new, decentralized management model and cancelled the project.

The examples above illustrates that there are both good examples of ERP projects, where companies experienced benefits from their ERP system and also failures where the companies spent time and money for the implementation and could not experiece any benefit from their ERP systems. Most of the researchers state that main reasons for the failures are not technical problems about the software but managerial problems of the companies (Davenport,1998; Scott et al., 2000).

1.4. Motivation for Implementing ERP

Despite the richness of ERP systems in terms of functionality and potential benefits to the companies, companies may implement ERP systems for different reasons (Ross, 1999). Some companies have largely technical reasons for implementing ERP systems. Examples for these technical reasons may be the desire to reduce the mainframe system operating costs, the need to solve the Y2K and similiar problems, to need for increased systems capacity to handle growth or the need to solve maintenance problems of old legacy systems . However many of the companies have significant business needs for implementing ERP systems. For example a company may desire, but not have due to the limitations or problems in the existing system, to be the one face to the customer with ability to reach inventory levels, production capability and available to promise information on a regional or global basis, which will improve customer satisfaction and efficiency of sales cycle (Markus and Tanis, 2000).

Markus and Tanis (2000), developed a framework for 'Reasons for ERP Implementation' as in Table 1.2. They have classified motivations as technical and business reasons. Another classification done by the researchers was that, reasons for implementing ERP differ upon the size and compexity of the Company in terms of structure. According to them, ERP implementation reasons of small size companies are a subset of ERP implementation reasons of big companies.

Table 1.2 Reasons for implementing ERP

	Small Companies/ Simple Structures	Large Companies/ Complex Structures
Technical Reasons	• Solve Y2K (Year 2000) and similiar problems • Integrate applications cross functionality • Replace hard –to-maintain interfaces • Reduce software maintenance burden through outsources • Eliminate redundant data entry and concomitant errors and diffuculty in analyzing data • Improve IT architecture • Ease technology capacity constraints • Decrease computer operating costs	Most Small/ Simple Company reasons plus • Consolidate multiple different systems of the same type (e.g., general ledger packages)
Business Reasons	• Accommodate business growth • Acquire multilanguage and multicurrency IT support • Improve informal and/or inefficient business processes • Clean up data and records through standardization • Reduce business operating and administrative expenses • Reduce inventory carrying costs and stockouts • Eliminate delays and errors in filling customers' orders for merged businesses	Most Small/ Simple Company reasons plus • Provide integrated IT support • Standardize different numbering, naming, and coding schemes • Standardize procedures across different locations • Present a single face to the customer • Acquire worldwide "available to promise" capability • Streamline financial consolidations • Improve companywide decision support

(Markus and Tanis, 2000)

Another important research about the subject of motivations for ERP implementations has been conducted by Ross and Vitale in 2000. Ross and Vitale conducted a research among 15 companies, who have already implemented one of the leading ERP softwares (SAP, Oracle, Baan, PeopleSoft) to examine impacts of ERP implementations on organizations. The research has significant results about the reasons of the companies for implementing an ERP systems. Six common motivations cited by the companies surveyed were:

- Need for a common platform
- Process improvement
- Data visibility
- Operating cost reductions
- Increased customer responsiveness
- Improved strategic decision making

The dominant motivation for an ERP implementation is to provide a common systems platform. Existance of multiple systems made companies' underlying information platforms highly inefficient and unreliable. In addition to these maintaining the integration between different systems was very costly and time consuming (Ross and Vitale, 2000).

Ross and Vitale examined that most of the companies expect their ERP system will enable process improvements. In some cases the companies want to improve specific processes as logistics, production scheduling or customer service. These tended to be cost driven reasons for ERP implementation.

In many cases, management is concerned with process standardisation to ensure quality and predictability of global business processes. Through process standardization, managers expect reduced cycle times from order to delivery, which will increase customer responsiveness.

Another significant reason for implementing ERP system is data visibility. Since ERP systems are highly integrated systems, they enable a high visibility of all related information. Also the online, real time data processing capability of ERP systems can

provide actual rather than historical information on a firm's performance (Ross and Vitale, 2000).

The impact of data visibility due to integrated structure of ERP systems, is expected to extend that the systems will improve strategic decision making processes in companies.

1.5. Success Measures for ERP Projects

There is a lack of consensus about the meaning of success in ERP implementation projects (Markus and Tanis, 2000).

Wight (1981) proposed a classification system named ABCD for MRP II user companies. Wight's main concern was the integration between modules. Some companies may use MRP II just for material planning purposes in MRP level, others may use MRP II system just for inventory control and some may utilize complete MRP II functionality. Study of Wight sets a paralled between the success level of MRP II implementation and the completeness of MRP II functionality utilized.

Markus and Tanis stated that project success should be defined in different perspectives. In their research, they stated that in an ERP implementation, there should be different metrics in different phases of the projects to measure the success of the project. Minimum set of success metrics should be:

- *Project Metrics*: Performance of project team against planned schedule, budget and scope. Aladwani used two major metrics in his study about IT project successes as:
    - *Adherence to budgets*
    - *Adherence to schedules* (Aladwani, 2002).
- *Early Operational Metrics:* Markus and Tanis defined Early Operational Metrics as how 'business operations' performed after the system becomes operational until 'normal operation' is achieved (Markus and Tanis, 2000). These metrics could be labor costs, time to fulfill customer order, inventory levels, missed customer orders, e.t.c.
- *Longer Term business Results:* How the organization performs at various times after normal business operation has been achieved (Markus and Tanis, 2000). These metrics

could be, return on investment, achievement of qualitative goals such as one face to customer, ease of upgrading to later versions, e.t.c.

Even Markus and Danis put different measurement metrics in different stages of implementation, they also state that ERP implementation success is highly relative. Success should be examined relative to the companies' unique goals for the ERP implementation. Two companies gained same improvement in inventory carrying costs can be defined as 'successful' in different ways. If one company's goal was to have a common platform, the company is more successful and if one companies goal was to increase market share with the implementation, the company may be less successful than expected. However, companies' goals may be insufficient, if the goals are compared to capabilities of ERP systems (Markus and Tanis, 2000). In this study achievement of general goals set by Ross and Vitale as 'Motivations for ERP' are used as success indicators.

There is a very important obstacle about using metrics to measure ERP project success, which is stated by Ross and Vitale as, most of the companies failed to establish performance metrics for ERP implementations, which makes measuring success of the implementation diffucult (Ross and Vitale, 2000).

Because of obstacles about using metrics in measuring ERP implementation performance and the obstacles about using achievment of companies' to their unique goals as success indicators, a different approach has been applied in this study as:

- Project metrics has been used as success measures as:
    - Adherence to budget
    - Adherence to time schedule (Markus and Tanis, 2000; Aladwani, 2002) .

  The data to measure the two metrics are available in every single project.

- Achievement of general ERP implementation goals, listed by Ross and Vitale as:
    - Need for a common platform
    - Process improvement
    - Data visibility
    - Operating cost reductions

- Increased customer responsiveness
- Improved strategic decision making

1.6. Critical Success Factors in ERP Implementations

Despite the benefits that can be achieved from a successful ERP system implementation, there is already evidence failure in projects related with ERP implementations (Davenport, 1998). Approximately researches illustrate that about 90 percent of implementations in all over the world are late or over budget, moreover the global ERP implementation success rate is about % 33 (Martin, 1998). The high figures about failures drove researchers to study about factors affecting ERP implementation success (Somers et al., 2000). It has been observed that, project managers generally focus on technical and financial aspects of a project and neglect to take into account the nontechnical issues. To solve this problem some researchers use critical success factors (CSF) approach in ERP implementation projects as it was done for reengineering projects, manufacturing systems implementation projects, etc. (Holland et al.,1999, Esteves et al., 2000).

There are several researches conducted about critical success factors topic (Holland et al., 1999; Stefanou, 1999; Parr et al., 1999; Sumner,1999; Wee, 2000; Rosario,2000; Bingi et al.,1999). However, research on critical success factors (CSFs) for ERP implementation is rare and fragmented. Nah, Lau and Kuang conducted a research in 2001 in which all relevant publications about CSFs for ERP implementations has been reviewed and a common model of CSFs has been built. The researchers found 10 researches in literature about CSFs in ERP implementation and they have summerized their findings as in Table 1.3.

Table 1.3 Survey of critical success factors in ERP

	Bingi et al. (1999)	Blockhout et al. (1999)	Falkowski et al. (1998)	Holland et al. (1999)	Roberts and Barrar (1992)	Rosario (2000)	Scheer and Habermann (2000)	Stefanou (1999)	Sumner (1999)	Wee (2000)
ERP Team Work and Composition	X	X	X	X		X		X	X	X
Change Management program and Culture	X		X	X	X	X			X	X
Top Management Support	X	X		X	X				X	X
Business Plan and Vision		X	X	X	X	X				X
BPR and Minimum Customization	X			X	X	X			X	X
Effective Communication			X	X		X			X	X
Project Management			X	X		X			X	X
Software Development, testing and troubleshooting	X			X		X	X			X
Monitoring and evaluation of Performance			X	X	X	X				
Project Champion			X			X		X	X	
Appropriate Business and IT Legacy				X	X					

(Nah et al., 2001)

The critical success factors listed in Table 1.3, which is a summary of relevant researches in literature illustrates that the critical success factors in ERP implementation are not technical factors, but managerial and business related factors. As Davenport stated, 'Those companies that stressed the *enterprise,* not the *system,* gained the greatest benefit from the implementations.' (Davenport, 1998, p.129).

The critical success factors can be described in detail as follows:

1.6.1. Appropriate business plan and IT legacy systems

Holland, Light, and Gibson (1999) stated that business and IT legacy systems determine the degree of IT and organizational change required for ERP implementation success. They emphasized that, the degree of organizational and technological change depends on the degree of complexity of the legacy systems. To be successful in an ERP implementation, issues arising from complexity of business and IT legacy systems should be overcomed.

1.6.2. Business plan and vision

Since duration of complete ERP implementation cycle is longer than the usual time frame need for typical business projects, clear implementation goals, a vision and a business plan are needed to guide implementation efforts (Nah et al., 2001). Wee (2000) stated that the business plan should outline proposed strategic and tangible benefits, resources, costs and risks, and the timeline. A clear business model of how the organization should operate with the implementation effort is crucial for a successful implementation and identifying measurable goals and benefits as well (Holland et al., 1999). Furthermore, Ross (1999) stated that companies progressing a continuous improvement in ERP implementation usually establish a long term vision.

1.6.3. Business process reengineering

Researchers as Holland et al. (1999), Bingi et al. (1999) stated that implementing an ERP system involves reengineering business processes to the best business practices served by ERP system. ERP systems are built on best practices followed in the industry (Zhang et al., 2002). All the processes in a company must conform to the ERP model. Up to a level of

'business process reengineering' during ERP implementation is crucial for minimizing the level of customization in ERP software, which should be done to fit ERP to companies business processes. Minimization of customization in ERP software is a very important success factor in ERP implementations (Parr et al. ,1999; Holland et al., 1999; Sumner, 1999). Minimization of customization in the software minimizes errors in the software and serves the advantage of upgrading system to newer versions and releases (Rosario, 2000).

1.6.4. Software development, testing, and troubleshooting

Software development and testing procedures unique to ERP projects should be thought and managed effectively. The overall ERP architecture should be established before deployment, taking into account the most important requirements of the implementation (Nah et al., 2001). Scheer and Habermann (2000) indicated that the use of appropriate modeling methods, architecture and tools will be beneficial in achieving ERP success. Holland et al. (1999) emphasized the improtance of trouble shooting software errors during ERP implementation. Companies should work closely to software vendors and consultants during all implementation period to resolve possible software related issues. Rosario (2000) stated that sophisticated and rigorous software testing eases implementation. Intensive testing process during implementation will be beneficial in identifying problems in the system and maintaining those problems before the system is began to be executed in the company.

1.6.5. Change management culture and program

Enterprise-wide structure change, which includes people, organization and culture change should be managed properly during ERP implementation (Rosario, 2000). A culture with shared values and a strong corporate identity that is conducive to change is critical for success (Nah et al., 2001). Bingi et al. (1999) states that user involvement in the design and implementation of new processes and the ERP system is very improtant to help users to understand how the ERP system will affect their jobs. Moreover, a formal training program for users may also be helpful for them to realize the impact of ERP system on their jobs and the whole processes of the company as well (Holland et al., 1999).

1.6.6. Communication

Communication issues are seen as central by a number of authors. In the study of Parr et al., 50 % percent of interviewees saw communication as a 'necessary condition' for ERP success. Holland et al. (1999), also stated that communication is a 'tactical CSF' for ERP implementations. Communication should be 'inwards' the project team and 'outwards' to the whole company. In other words, communication in an ERP project does not mean only the communication between the implementation team members, but also communicating the goals, results and status of the project throughout the whole company (Esteves et al., 2000). Employees should be informed about the project plan, scope, objectives, activities, and updates in advance (Sumner,1999). Monthly bulletins, newsletters, periodic meetings may be helpful communication tools. The research conducted by Shanks et al. (2000) illustrated that most of the project managers and consultants thought that ERP implementation was likely to fail when milestones and status were not communicated in advance to the related parties.

1.6.7. ERP team composition

Most of the researchers studied on critical success factors pointed to the importance of the team built for ERP implementation, in terms of composition of team and effectiveness of team work (Parr et al.,1999; Bingi et al., 1999; Holland et al., 1999). An ERP project involves all of the functional departments in a company. Bingi et al. (1999) stated that best people of the organization should be involved in ERP implementation team. Furthermore the ERP team should be balanced, or cross-functional, and comprise a mix of external consultants and internal staff so the internal staff can develop the necessary technical skills for design and implementation (Holland et al., 1999). Sumner (1999) emphasizes that both business and technical knowledge are essential for success. Therefore the sharing of information among various parties involved is vital. A partnership trust can provide such a knowledge share between consultants and internal team members.

1.6.8. Monitoring and evaluation of performance

In order to track the status and progress of an ERP implementation project, milestones and targets need to be actively monitored (Sumner, 1999). Roberts and Barrar (1992) indicated that two criteria may be used:

a. Project manageement based criteria should be used to measure against completion dates, costs, and quality.
b. Operational criteria should be used to measure against the production system.

Performance monitoring and feedback involves the exchange of information between project team members and analysis of feedback received from end users (Holland et al.,1999). Moreover, status reports from project management is crucial for top management to monitor the status of the project (Nah et al., 2001).

1.6.9. Project champion

Researchers as, Sumner (1999), Parr et al. (1999), Rosairo (2000) pointed that the existance of *Project Champion* is very crucial for successful ERP implementation. Parr et al. (1999) stated that the champion should act as an advocate for the system who is communicating the benefits of the ERP project in all over the company. Addtionally, the project champion's leadership skills play a critical role in implementation success, as the champion must continually resolve conflicts and manage resistance. In addition to these, project champion should motivate all project team members and ensure the commitment of all members. Therefore the project champion should be a high level executive of the company (Stefanou, 1999).

1.7. Main Organizational Factors

The listed nine factors in previous section are the critical success factors which most of the researchers' emphasized and Nah et.al (2001) unified in their research. In addition to these, there are two main critical success factors pointed by most of the researchers as main organizational factors are:

- Top Management Support

- Effective Project Management

In this research particulary, effects of these two CSFs on ERP implementation success have been studied. The relevant explanations for these two critical success factors are described in detail as below.

1.7.1. Top management support

Many studies have stressed top management support as a critical success factor for ERP implementations (Zhang, 2002; Bingi et al., 1999; Holland et al., 1999; Sumner, 1999; Wee, 2000; Parr et al., 1999). Most of the researchers pointed out the fact that top management support is a must for a successful ERP implementation project (Bingi et al., 1999; Parr et al., 1999; Zhang et al., 2003). In the study of Nah et al. (2003), in which the researchers examined the Chief Information Officers' perceptions of critical success factors by conducting a survey among CIO's of Fortune 1000 companies, top management support identified as the most critical factor for ERP implementation by the CIO's surveyed. In addition to these, Parr et al. (1999), clarified also that their anaysis illustrated that top management support is needed for a successfull project in all phases of the implementation.

Top Management must create an environment for implementing an ERP system and obtained results and must be seen as a participant of the implementation. top management support has two main facets: *(1) providing leadership* ; and *(2) providing necessary resources* (Zhang et al., 2002). How top Management could support the ERP implementation in these two main facets could be described as follows:

1.7.1.1. Providing leadership

Holland et al. (1999) stated that involvement of top management in ERP implementation as a part of the implementation team is essential for successful ERP implementation project. Top management should participate in a well functioning steering commitee, which monitors and directs implementation efforts. Steering commitee consists of high level executives of a the company, where ERP implementation project takes place, which has regular meetings with team members, spent time with team members and provide clear

directions to the implementation efforts (JDEdwards Consulting Guide, 1996). Top management should follow up the status of the project during whole implementation cycle (Zhang et al., 2002). Weekly status reports released by project management, or regular meetings with team members could be useful in this manner (Sumner, 1999). Top management support is very essential for ERP implementation project in terms of giving appropriate timing to the implementation project (Davenport, 1998). As it has been stated above companies should have a clear *business plan* for ERP implementation projects. Top management should support the business plan created for ERP implementation and should eliminate the pressure on team members and project management because of ineeficient time frame allocated for implementation project. Top management should not insist on rapid implementations (Davenport, 1998).

Top management should support project management in resolution of the conflicts within the implementation team and also with the external parties within the organization (Roberts and Barrar, 1992). Since ERP implementation project teams are temporary organizations consist of people from different parties of the company and external professionals (consultants) as well, conflicts may occur between parties. In addition to these, a matrix organization is established in the company due to the constructed temporary implementation team. Every team member has a functional manager, to whom, the team member usually reports and also the project manager manages all team members in implementation activities. The matrix organization structure causes conflicts between the functional managers and the project management. Top management's involvement, in terms of supporting project management in resolution of such conflicts is very essential for the success of the project.

An organizational change, which includes also change of business processes and roles is an outcome of ERP projects (Rosario, 2000). Therefore, barriers within the company against the implementation will exist during all implementation cycle (Robey et al., 2002). There would be different parties that resists the ERP implementation because of various organizational and political reasons. In this manner, top management should advocate ERP implementation within the organization and support ERP implementation to comeover all resistance and barriers against ERP implementation project (Parr et al., 1999). Top

management should communicate new rules, policies and changes due to ERP project throughout the organization. Communicating new rules and policies throughout the organization by Top Management would decrease the resistance against new policies and processes (Nah et al., 2001; Parr et al., 1999).

1.7.1.2. Provide Necessary Resources

The other facet of top management support in ERP implementation project is providing necessary resources needed for the ERP implementation project. Top management should be committed to the ERP implementation project with their willingness to allocate valuable resources to the implementation effort (Holland et al., 1999). This involves providing necessary staff for the implementation project, which supposed to be best people of the organization (Bingi et al., 1999; Parr et al., 1999). Top Management should also allocate other needed budget for ERP implementation as hardware, software expenditures, working place and consulting expenses where needed (Holland et al., 1999; Zhang et al., 2002).

1.7.2. Effective project management

Effective project management is essential for a successful ERP implementation. . It is known that although some projects fail for technical reasons, most project failures are caused by people who ignore the principles of good project management (Jurison, 1999). Rosario (2000) stated that an individual or group of people should be given the responsibility to drive success in project management. Mousseau (1998) defined project management as the process by which a project is initiated, controlled and brought to a successful conclusion. He stated that project manager is the most valuable resource of an ERP implementation project.

Project management's first duty in the project is to define the project scope in terms of the amount of system implementation, involvement of business units, technology to be replaced and exchange of data (Holland et al., 1999).

Project management should estimate the time needed for implementation and overall cost of the project (Davenport, 1998). The estimation of needed time for the implementation and cost of the implementation is essential for identifying the needs of the project which

should be approved and provided by top management (Jurison, 1999). Researches on ERP projects illustrate that unrealistic time and cost estimations are major failure reasons (Davenport, 1998).

After estimeting the needed time for the implementation, Project management should prepare a clear implementation plan. The project plan should include project milestones and clear delivery dates (Holland et al., 1999). Project Plan with clear realistic milestones are essential for controlling the implementation efforts throughout the project and verify the performance of the project (Shanks et al., 2000). The formal project plan of the implementation should be communicated and approved by Top Management (Jurison, 1999).

The other main facet of project management in the planning phase of the implementation is to prepare the budget. Project management should determine the total project budget by aggregating all direct and indirect costs. Prepared budget should be communicated and approved by top management (Jurison, 1999).

The main resource of the implementation project, rather than the money and time, is actually the implementation team. Project management should assemble the project team with right people, selected from whole organization as best people of the organization (Bingi et al., 1999). Assembling the project team, in terms of selecting appropriate staff, who will participate in implementation activities is one of the important facets of effective project management (Jurison, 1999).

Project management should always monitor and verify the performance of the implementation project's status through project milestones and objectives. Project management's criteria for verification of the progress should be completion times, cost and quality of the project (Nah et al., 2001). Project management should organize periodic status meetings, where the status of the project and performance of the implementation team is communicated (JDEdwards Consulting Guide, 1996). In addition to these weekly status reports are also useful tools for verification and communication of the progress (Nah et al., 2001).

Management and coordination of the implementation team is one of the keys of successful project management. It is clear that the project team is a temporary cross functional organization and management of all parties in this organization is very essential for the effective implementation. Project Manager should enable the coordination between different parties of the implementation team consists of external consultants and internal staff (Zhang et al., 2001). Mousseau (1998) stated that project manager should a good interface manager who should eliminate the conflicting situations within the team. He also stated that project manager should act as a coach, keeping his staff motivated and in harmony.

Project manager should also establish an effective communication within the implementation team and among other parties of the organization (Falkowski et al., 1998). Team members should be notified about the project plan, scope, goals and activities in advance (Sumner, 1999). Project status and progress should also be communicated within team (Zhang et al., 2002) and throughout the organization (Holland et al., 1999).

For a successful project management, project manager should be selected very carefully (Mousseau, 1998). Project manager should also be project champion (Zhang et al., 2002; Sumner, 1999; Mousseau, 1998), where project champion is literally defined as a high level executive sponsor who has the power to set goals and legitimize change, which states to a business leader should be in charge with a business perspective (Sumner, 1999). Project champion is seen as the owner of the project and the role for the champion is very important in marketing of the project throughout the organization. It is clear that project champion will be in charge of resolving conflicts and manage resistance against the ERP implementation in the organization (Parr et al., 1999). The outcome of these definitions states clearly that the project manager should be a high level executive of the organization to be also project champion. Nah et al. (2001) classified existance of *project champion* as a seperate CSF in their unification study. However, researchers as Zhang et al. (2002) and Mousseau (1998) state that project manager should also be project champion.

1.8. Other Studies About Critical Success Factors

After their research on unification of crititical success factors for ERP implementations, Nah et al. conducted another research in 2003. They conducted a survey of Chief Information Officers (CIOs) from Fortune 1000 companies on their perceptions of critical success factors for ERP implementation that the researchers have been listed in their former research in 2001. The most critical five success factors have been identified by CIOs as a result of the survey were, top management support, project champion, ERP teamwork and team composition, project management and change management (Nah et al., 2003).

Another research for unification of critical success factors for ERP implementations - as the research conducted by Nah et al. (2001) - has been conducted by Esteves and Pastor in 2000. The researchers studied former researches (Holland et al., 1999; Sumner, 1999; Stefanou, 1999) conducted on CSFs in ERP implementations and clarified the similarities of CSFs studied by the researchers. As a next step the researchers map the CSFs determined in a matrix as in Table 1.4.

Table 1.4. Critical success factors in ERP implementations matrix of Esteves and Pastor

	Strategic	Tactical
Organisational	1.Sustained Management Support 2.Effective Organisation Change Management 3.Good Project Scope Management 4.Adequate Project Team Composition 5.Comprehensive Business Process Reengineering 6.Adequate Project Champion Role 7.User Involvement and Participation 8.Trust between Partners	1.Dedicated Staff and Consultants 2.Strong Communication inwards and outwards 3.Formalised Project Plan/Schedule 4.Adequate Training Program 5.Reduce Trouble shooting 6.Appropriate Usage of Consultants 7.Empowered decision makers
Technological	1. Adequate ERP Implementation Strategy 2. Avoid Customisation 3. Adequate ERP Version	1. Adequate Software Configuration 2. LegacySystems

(Esteves and Pastor, 2000)

The researchers classified the CSFs as *organizational* and *technological* factors upon the nature of the factor, where technological factors are software and IT related factors and organizational factors are business and management related factors. In addition to these; CSFs classified also as *strategic factors*, which are related with long term organizational goals upon ERP implementation and *tactical factors*, which are related with short term organizational goals upon ERP implementation (Esteves and Pastor, 2000). Actually the classification is same as the classification of CSFs constructed by Holland et al. (1999).

Esteves and Pastor have conducted another research in 2001, where they have analyzed the relevance and importance of CSFs they have clarified in their former research in an SAP implementation project. The researchers analyzed the ASAP (Accelerated SAP) implementation methodology introduced by SAP AG in 1996. Researchers determined the phases of the ASAP methodology and then examined the importance of each CSF in each ASAP phase. They have created a matrix of each ASAP phase and each CSF where the elements of matrix is the degree of relevance of the CSF in each ASAP phase. The conculison of the researchers was project champion, formalized project plan and sustained management support are most relevant CSFs for all phases of ASAP (Esteves and Pastor, 2001).

Zhang et al. (2002) examined the CSFs for ERP implementation in Chinese implementation projects. The researchers created a model of CSFs out of literature as, top management support, effective project management, BPR, education and training, user involvement, data accuracy, vendor support and Chinese organizational culture. Then researchers conducted a survey in Chinese companies which implemented an ERP system. After their study, researchers examined concluded that BPR has the biggest impact on ERP implementation success in China. Moreover, top management support, effective project management and user involvement also have impact on ERP implementation success. Interesting finding of the research was Chinese organizational culture has a negative impact on ERP implementation success (Zhang et al., 2002).

Sarker and Lee (2003) examined three social enablers – leadership, communication and empowered implementation team - in ERP implementation by using a case study. The researchers concluded that leadership at top management level and project management level must be given significant priority throughout the implementation for success. However, communication and empowered implementation team are not generalizable necessary conditions for succesful ERP implementations. Researchers empahsized the contradiction between the emprical evidence and the literature, which may a challenge for further research.

CHAPTER II

METHOD

2.1. The Purpose of the Research

The main purpose of this research is to examine top management support and effective project management as critical success factors in ERP implementations. For this purpose, we analyzed a number of multinational pharmaceutical companies doing business in Turkey and the relationship between top management support, effective project management and project success in these ERP implementation projects.

2.2. Research Questions

The major research questions addressed by this study are;

A. What is the nature of the relationship among top management support, effective project management and ERP implementation success level in Turkish branches of multinational pharmaceutical companies?

B. Is top management support affect the relationaship between effective project management and project success level in Turkish branches of multinational pharmaceutical companies?

2.3. Research Design

In this study, shematic diagram of the research framework could be illustarated seperately for research question A and research question B.

Shematic diagram for research question A is illustrated in Figure 2.1, where relation between top management support and success level of ERP implementation project and effective project management is shown.

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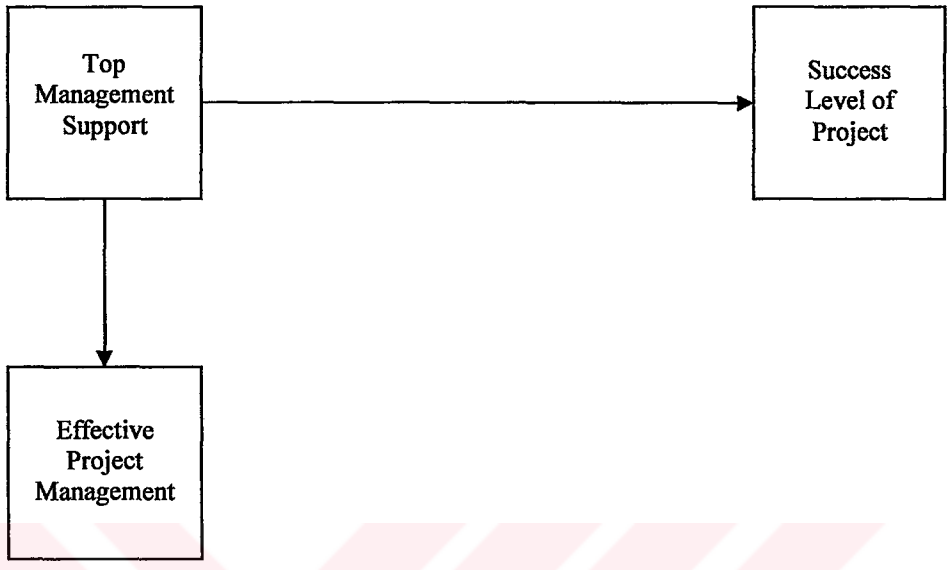
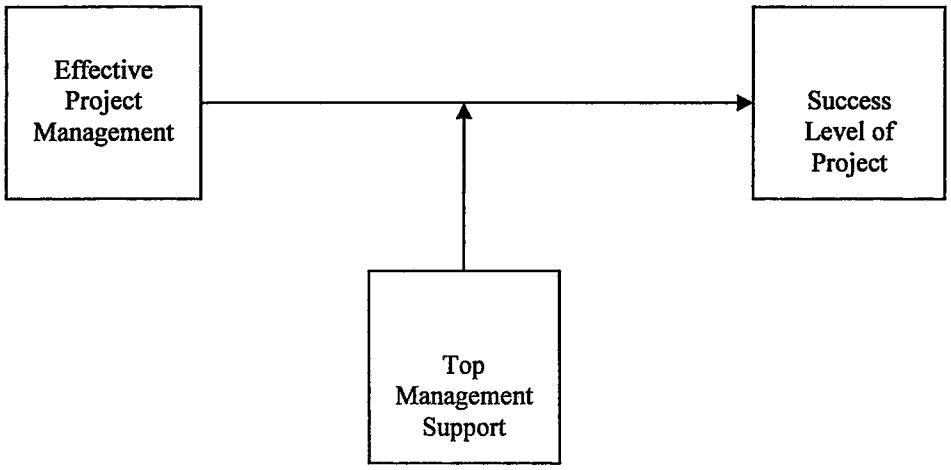
Figure 2.1 Shematic diagram of the study for research question A



Shematic diagram for research question B is illustrated in Figure 2.2, where affect of effective project management and success level of project and moderating effect of top management support are shown.

Figure 2.2 Shematic diagram of the study for research question B



2.3.1. Type of the research:

The purpose of this study is to understand the relationship among top management support, effective project management and ERP implementation success level. This project is a correlational rather than a causal study. Since this reserch project will attempt to examine the relationship between the selected variables, this is an explanatory study (hypothesis testing).

2.3.2. Nature of the research

The study is analytical in nature.

2.3.3. Time horizon

This study was a cross-sectional one in nature. Since the data for this study were collected within 2 months (April – May, 2004). No pervious research had been done on these organizations, nor was any subsequent extension of the research complated.

2.3.4. Unit of analysis

The research had been conducted among selected individuals employeed in targeted companies (Turkish branches of multinational pharmaceutical companies) to examine the relationship among top management support, effective project management and success level of ERP project. To examine the relationship among these variables individuals participated in research had been the unit of analysis.

2.3.5. Research hypotheses

Four hypotheses were developed to examine these research questions:

H1: The variables of 'allocation of needed budget', 'allocation of skilled team members', 'participation in implementation' and 'support implementation to comeover implementation barriers' in relation to top management support make the biggest contribution to the success level of ERP implementation projects carried out in Turkish branches of multinational pharmaceutical companies.

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H2: Effective project management has a significant impact on success level of ERP implementation projects carried out in Turkish branches of multinational pharmaceutical companies.

H3: Top management support has a significant impact on effective project management in ERP implementation projects carried out in Turkish branches of multinational pharmaceutical companies.

H4: Degree of top management support increases the impact of effective project management on success level of ERP implementation projects carried out in Turkish branches of multinational pharmaceutical companies.

2.4. Research Variables

There are three main variables in this study. Theese are:

- Top management support
- Effective project management
- Success level of project

Each of the variables consists of several attributes. The attributes of each variable can be illustrated as follows:

Table 2.1 Attributes of top management support

Variable: top management support	
Attributes	**Definitions based on literature**
Participation in implementation	Top management should participate in a well functioning steering commitee, which monitors and directs implementation efforts (JDEdwards Consulting Guide, 1996)
Follow up the status of the project	Top management should follow up the status of the project during whole implementation cycle (Zhang et al., 2002)
Giving appropriate timing to the project.	Top management support is very essential for ERP implementation project in terms of giving appropriate timing to the implementation project (Davenport, 1998).
Support PM for conflict resolution.	Top management should support project management in resolution of the conflicts within the implementation team and also with the external parties within the organization (Roberts and Barrar, 1992)
Support implementation to comeover the barriers against implementation.	Top management should support implementation to comeover the barriers within the company against the implementation which will exist during all implementation cycle (Robey et al., 2002)
Communicate new rules and policies.	Communicating new rules and policies throughout the organization by top management would decrease the resistance against new policies and processes (Nah et al., 2001)
Allocate well – skilled people to the implementation team.	Top management should be committed to the ERP implementation project with their willingness to allocate valuable resources to the implementation effort (Holland et al., 1999).
Allocate needed budget for needed expenditures	Top Management should allocate needed budget for ERP implementation as, hardware, software expenditures, working place, consulting expenses, where needed (Holland et al., 1999)

Table 2.2 Attributes of effective project management

Variable: effective project management	
Attribute	**Definitions based on literature**
Defining the scope of the project	Project managers should define the project scope (Holland et al., 1999)
Estimating time and cost properly	Project management should estimate the time needed for implementation and overall cost of the implementation (Davenport, 1998)
Project plan preperation	Project manager should prepare a clear implementation plan (Holland et al., 1999).
Develop budget	Project management should determine the total project budget by aggregating all direct and indirect costs (Jurison, 1999)
Assemble project team effectively	Project management should assemble the project team with right people, selected from whole organization as best people of the organization (Bingi et al., 1999).
Verify performance of the implementation	Project management should always monitor and verify the performance of the implementation project's status through project milestones and objectives (Nah et al., 2001)
Manage and coordinate team effectively	Management and coordination of the implementation team is one of te keys of successful project management (Zhang et al., 2002)
Establish effective communication	Project manager should also establish an effective communication within the implementation team and among other parties of the organization (Falkowski et al., 1998).
Project champion	Project manager should also be the project champion (Zhang et al., 2002)

Table 2.3 Attributes of success level of ERP projects

Variable: success level of ERP project	
Attribute	**Definitions based on literature**
Adherence to time schedule	Project should be completed within the time schedule determined for the project (Aladwani, 2002)
Adherence to budget	Project should be completed within the budget allocated for the project (Aladwani, 2002)
Level of benefits gained from ERP	Generalization of expectations from ERP projects set by Ross and Vitale (2000) as : a. Having a common platform , b. Process improvement, c. Data visibility, d. Operating cost reductions, e. Increased customer responsiveness, f. Improved strategic decision making

2.5. Sampling and Procedure

Judgement sampling, one of the "purposive sampling" design, was used for this study. The sample covered significantly selected employees of 9 Turkish branches of multinational pharmaceutical companies which already implemented one of the major ERP systems of SAP, Baan, Oracle, PeopleSoft or JDEdwards, which are the big players of global ERP market (Klaus et al., 2000; Davenport, 1998).

We made a list of companies which satisfies the requirements as described in the scope of the study. Nine companies listed for the study which are operating in Turkey as a branch/ affiliate of multinational pharmaceutical companies and implemented one of the major ERP systems.

Three main groups of individuals who were surveyed from these companies to get the information were composed as:

- Project manager

- Two team members participated in implementation
- Two functional managers

The purpose behind the selection of the respondents was:

- Project manager of each implementation was the most suitable resource to get the information about planned time to be spent for the implementation and planned budget and actuals as time spent and total implementation cost as well. Moreover top management support elements and project management elements were the best resources to get information.
- Team members were another resource to get the information about top management support elements and effectiveness of project management as well.
- Functional managers were the most appropriate people to get information for implementation success besides top management support and project management as well.

Therefore five employees from each of nine companies, TOTAL of 45 employees were the sample size of this study.

The research sample covered relatively small size of employees who have particular responsibilities and duties for the implementation of ERP projects in companies all of which are multinational, operating in the same industry and implemented ERP systems, which has similiar complexity, scope and functionality.

One week duration were given to the respondents to answer the questions. Some of the employees refused to answer the questionnaire and some requested additional time to answer the questions.

27 employees out of 6 companies returned with their answers at the end of fifth week. 3 questionnaires were classified as not suitable for analysis, therefore 24 questionnaires out of 6 companies classified as suitable for analysis. Each questionnaire was coded for data

entry purposes and entered into the Statistical Package for the Social Sciences (SPSS) data editor.

2.6. Measurement Instruments

The instrument (total of 41 items) used in the study was designed by the researcher to collect the data necessary to test the research hypotheses. The instrument combines three scales: top management support scale, effective project management scale and success level of ERP projects scale.

Top management scale consists of items for all attributes of top management support. The items are illustrated in Table 2.4. as:

Table 2.4 Top management support measurement instrument

Top Management Support		
Attribute	**Reference**	**Item Number**
Participation in implementation	(JDEdwards Consulting Guide, 1996)	TMS.1, TMS.2, EPM.12
Follow up the status of the project	(Zhang et al., 2002)	TMS.5, EPM.10, EPM.13
Giving appropriate timing to the project.	(Davenport, 1998)	TMS.6, EPM.6
Support PM for conflict resolution.	(Roberts and Barrar, 1992)	TMS.4
Support implementation to comeover the barriers against implementation.	(Robey et al., 2002)	TMS.8, TMS.10
Communicate new rules and policies.	(Nah et al., 2001)	TMS.9
Allocate well – skilled people to the implementation team.	(Holland et al., 1999).	TMS.4, TMS.7, EPM.16, EPM.21
Allocate needed budget for needed expenditures	(Holland et al., 1999)	TMS.4, TMS.7

Each item employed a Likert- type scale, ranging from 1 (totally disagree) to 6 (totally agree).

Project Management Scale consist of items to measure all attributes of effective project management as illustrated in table 2.5.

Table 2.5 Effective project management measurement instrument

Effective Project Management		
Attribute	**Reference**	**Items**
Defining the scope of the project	(Holland et al., 1999)	EPM.2
Estimating time and cost properly	(Davenport, 1998)	EPM.3
Project plan preperation	(Holland et al., 1999).	EPM.5
Develop budget	(Jurison, 1999)	EPM.11
Assemble project team effectively	(Bingi et al., 1999).	EPM.15, EPM.16, EPM.17, EPM.18, EPM.19, EPM.20
Verify performance of the implementation	(Nah et al., 2001)	EPM.13, EPM.8, EPM.9
Manage and coordinate team effectively	(Zhang et al., 2002)	EPM.21, EPM.22
Establish effective communication	(Falkowski et al., 1998).	EPM.23
Project champion	(Zhang et al., 2002)	EPM.1, EPM.4

Items of this section employed a Likert- type scale, ranging from 1 (totally disagree) to 6 (totally agree).

Success Level of Project Section consist of items to measure as illustrated in Table 2.6

Table 2.6 Success level of ERP project measurement instrument

Success level of ERP project		
Attribute	**Reference**	**Items**
Adherence to Time schedule for Implementation	(Aladwani, 2002)	EPM.7, SLP.1
Adherence to Budget for Implementation	(Aladwani, 2002)	EPM.14, SLP.2
Level of benefits gained from ERP Implementation		
a. Having a Common Platform for all functions	(Ross and Vitale, 2000)	SLP.3
b. Process Improvement throughout Organization	(Ross and Vitale, 2000)	SLP.4
c. Data Visibility	(Ross and Vitale, 2000)	SLP.5
d. Operating Cost Reductions	(Ross and Vitale, 2000)	SLP.6
e. Increased Customer Responsiveness	(Ross and Vitale, 2000)	SLP.7
f. Improved Strategic Decision Making	(Ross and Vitale, 2000)	SLP.8

Except two items of this section employed a Likert- type scale, ranging from 1 (totally disagree) to 6 (totally agree). The two items are items to measure actual project cost and duration, which are answered in numeric values.

Because of the nature of the study no questions designed for collecting socio demographic information have been included in the questionnaire. There were a total of 5 reverse items t in the measurement instrument. Item label coding for the survey is shown in Appendix B.

CHAPTER III

DATA ANALYSIS

This chapter presents the analyses and findings of the study based on questionnaires distributed to the selected employees from Turkish branches of multinational pharmaceutical companies which have implemented one of major ERP systems. Several statistical techniques were used to test the research hypotheses. These techniques were correlations, factor anaysis, regression analysis, means, standard deviations and other statistics were obtained. In addition, Cronbach's alpha was calculated to evaluate the internal consistency of each scale.

3.1. Reliability Analysis

Reliability analyses were computed to assess the internal consistency of the measures. Details of this analysis applied on measurement device is illustrated in Table 3.1.

The result of reliability analysis indicated that Cronbach's alpha for the measurement instrument is 0,9284. Reliabilities over 0,80 are generally considered as good and where the closer reliabilities to 1,0 , is obviously better (Sekeran, 2000, p.312). Therefore, the internal consistency reliability of the measurement instrument used in this study is considered to be satisfactory.

Table 3.1 Details of reliability analysis

Reliability Analysis - Scale (Alpha)				
Item Label	**Scale Mean if Item Deleted**	**Scale Variance if Item Deleted**	**Corrected Item-Total Correlation**	**Alpha if Item Deleted**
TMS1	150,8846	539,2262	0,4825	0,9266
TMS2	151,4615	529,2985	0,6474	0,9249
TMS3	150,9231	531,0338	0,6442	0,9250
TMS4	150,8846	525,7062	0,8012	0,9236
TMS5	151,9615	519,1585	0,7750	0,9233
TMS6	151,1923	526,4015	0,7060	0,9242
TMS7	151,3462	569,9954	-0,0575	0,9335
TMS8	152,6538	571,7554	-0,0809	0,9343
TMS9	151,2692	536,5246	0,5556	0,9259
TMS10	151,7692	524,9046	0,6741	0,9245
EPM1	151,0000	535,6800	0,5054	0,9264
EPM2	151,8846	574,5062	-0,1240	0,9338
EPM3	152,1154	561,4662	0,0693	0,9316
EPM4	151,1538	538,4554	0,4298	0,9273
EPM5	151,4231	533,3738	0,6455	0,9251
EPM6	151,0769	533,9138	0,7710	0,9244
EPM8	151,2308	531,2246	0,6181	0,9252
EPM9	151,3846	539,5262	0,4880	0,9266
EPM10	151,2692	533,8846	0,5705	0,9257
EPM11	151,5769	536,4138	0,6870	0,9250
EPM12	150,9231	529,8338	0,7350	0,9243
EPM13	151,4231	533,6938	0,7828	0,9244
EPM15	151,0385	536,1985	0,5070	0,9264
EPM16	151,1538	535,4154	0,5149	0,9263
EPM17	152,9231	595,9938	-0,5432	0,9358
EPM18	151,0769	526,3938	0,7330	0,9240
EPM19	151,1538	537,1754	0,6282	0,9254
EPM20	153,5000	584,9000	-0,3843	0,9336
EPM21	152,7692	547,9446	0,3775	0,9276
EPM22	151,4231	537,0538	0,5933	0,9256
EPM23	152,1923	507,4415	0,8032	0,9225
SLP3	150,5769	533,9338	0,7124	0,9247
SLP4	151,1154	531,1462	0,7067	0,9245
SLP5	151,3462	526,3154	0,7541	0,9239
SLP6	151,7692	531,7846	0,7669	0,9243
SLP7	152,0000	533,6800	0,6034	0,9254
SLP8	151,4615	517,9385	0,8107	0,9229

Reliability Coefficients		
No of Cases	**No of Items**	**Alpha**
26	**37**	***0,9284***

3.2. Tests of Hypotheses

Setpwise Regression Analysis was used for testing the first three hypotheses and an ANOVA analysis was conducted for the last hypothesis.

3.2.1. Hypothesis 1: Attributes of top management support and success level of ERP projects

H1: The variables of 'allocation of needed budget', 'allocation of skilled team members', 'participation in implementation' and 'support implementation to comeover implementation barriers' in relation to top management support make the biggest contribution to the success level of ERP implementation projects carried out in Turkish branches of multinational pharmaceutical companies.

A regression analysis was performed for testing Hypothesis One. The results indicated that the independent variables of allocate well – skilled people to the implementation team and support implementation to comeover the barriers against implementation were able to explain almost two third (65 %) of the variance in the dependent variable of success level of ERP projects. In this case, Hypothesis One was partially substentiated. While the variable of allocate well – skilled people to the implementation team was able to explain 55%, the variable of support implementation to comeover the barriers against implementation was able to explain 9% of the dependent variable of success level of ERP projects. In terms of F value (31.097) is highly significant ($p<0.001$) and it indicates validity of regression model. Durbin-Watson test was also confirm this result. The Beta (0,75; 0,30) coefficients of the two independent variables were able to explain high level of contribution to the dependent variable. Furthermore the T-tests results were also statistically highly significant. The details of the regression analysis are illustrated in Table 3.2.

Table 3.2 Regression analysis of top management support attributes and success level of ERP projects

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	0,751a	0,564	0,546	17,56058	0,564	31,097	1	24	0,000	
2	0,808b	0,652	0,622	16,02572	0,088	5,817	1	23	0,024	1,545

a. Predictors: (Constant), Alloc Skilled Team
b. Predictors: (Constant), Alloc Skilled Team, Support Imp to Barriers
c. Dependent Variable: Total of SLP

Anova

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	9589,547	1	9589,547	31,097	,000a
	Residual	7400,973	24	308,374		
	Total	16990,520	25			
2	Regression	11083,578	2	5541,789	21,578	,000b
	Residual	5906,943	23	256,824		
	Total	16990,520	25			

a. Predictors: (Constant), Alloc Skilled Team
b. Predictors: (Constant), Alloc Skilled Team, Support Imp to Barriers
c. Dependent Variable: Total of SLP

Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
	B	Std. Error	Beta			Zero-order	Partial	Part
1 (Constant)	-107,19	20,487		-5,232	0,000			
Alloc Skilled Team	6,716	1,204	0,751	5,576	0,000	0,751	0,751	0,751
2 (Constant)	-133,858	21,721		-6,163	0,000			
Alloc Skilled Team	6,675	1,099	0,747	6,073	0,000	0,751	0,785	0,747
Support Imp to Barriers	3,886	1,611	0,297	2,412	0,024	0,308	0,449	0,297

a. Dependent Variable: Total of SLP

The relevant regression equation is as follows:

(Total of SLP)y = 133.86 + (Alloc Skilled Team) 6.68 + (Support Imp to Barriers)3.89

3.2.2. Hypothesis 2: Effective project management and success level of ERP projects

H2: Effective project management has a significant impact on success level of ERP implementation projects carried out in Turkish branches of multinational pharmaceutical companies.

Hypothesis two was also tested by employing regression analysis. The results indicated that two independent variables, which are attributes of effective project management, namely, establish fffective communication and project champion were able to explain 66% percent of the variance in the success level of ERP projects. Establish effective communication was able to explain 50% percent of the variance and project champion was able to explain 14% of the variance in the dependent variable success level of ERP projects. All of the findings were significant. The F tests and beta values together with t values indicated that the regression model was valid and had a satisfactory explanatory power. Moreover Durbin –Watson test indicated that outcome of the regression analysis is reliable. Details of regression analysis is shown in Table 3.3 .

In addition to the regression analysis, a Pearson product-moment correlation analysis was applied with summed scores of effective project management, top management support and success level of ERP as test variables as shown in Table 3.4. The results of correlation analysis also indicate that effective project management and success level of ERP are positively related.

The results of the tests applied concluded that effective project management has an impact on success level of ERP projects and two main attributes of effective project management, establish effective communication and project champion make biggest impact on success level of ERP projects. Therefore hypothesis two was accepted.

Table 3.3 Regression Analysis of effective project management and success level of ERP projects

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	0,723a	0,522	0,502	18,39141	0,522	26,232	1	24	0,000	
2	0,812b	0,659	0,630	15,86609	0,137	9,248	1	23	0,006	1,285

a. Predictors: (Constant), Effective Communication
b. Predictors: (Constant), Effective Communication, Project Champion
c. Dependent Variable: Total of SLP

Anova

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8872,663	1	8872,663	26,232	,000a
	Residual	8117,858	24	338,244		
	Total	16990,520	25			
2	Regression	11200,664	2	5600,332	22,247	,000b
	Residual	5789,856	23	251,733		
	Total	16990,520	25			

a. Predictors: (Constant), Effective Communication
b. Predictors: (Constant), Effective Communication, Project Champion
c. Dependent Variable: Total of SLP

Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
	B	Std. Error	Beta			Zero-order	Partial	Part
1 (Constant)	-36,084	8,872		-4,067	0,000			
Effective Communication	11,732	2,291	0,723	5,122	0,000	0,723	0,723	0,723
2 (Constant)	-78,898	16,024		-4,924	0,000			
Effective Communication	7,787	2,364	0,480	3,294	0,003	0,723	0,566	0,401
Project Champion	6,100	2,006	0,443	3,041	0,006	0,706	0,536	0,370

a. Dependent Variable: Total of SLP

The relevant regression equation is as follows:

(Total of SLP)y = -78.898 + (Effective Communication)7.787 + (Project Champion)6.100

3.2.3. Hypothesis 3: Top management support and effective project management

H3: top management support has a significant impact on effectiveness of project management in ERP implementation projects carried out in Turkish branches of multinational pharmaceutical companies.

Hypothesis three was tested by regression analysis. A stepwise technique was used for regression analysis to understand which attributes are able to explain the variance in dependent variable of effective project management. Two independent variables of support project management in conflict resolution and participation in implementation were able to explain %74 of the variance in dependent variable of effective project management, where support project management in conflict resolution was able to explain 60% and participation in implementation was able to explain 13% percent of the variance in effective project management. F value (38,592) is highly significant ($p<0.001$) andf indicates the validity of regression model. Durbin-Watson test was also confirm this result. Furthermore t tests were also statistically significant. Details of the regression analysis is available in Table.3.4.

Moreover a Pearson product-moment correlation analysis with summed scores effective project management, top management support and success level of ERP projects as test variables as shown in Table 3.5. The results of the correlation analysis indicated that top management support and effective project management are positively related.

The analysis illustrated that top management support has a significant impact on effective project management and two attributes of top management support, support project management in conflict resoluiton and participation in implementation make biggest impact on effective project management. Therefore hypothesis three was accepted.

Table 3.4 Regression Analysis of top management support and effective project management

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	0,785a	0,617	0,601	6,52039	0,617	38,592	1	24	0,000	
2	0,862b	0,743	0,72	5,45699	0,126	11,265	1	23	0,003	2,22

a. Predictors: (Constant), Support PM in Conflict Res
b. Predictors: (Constant), Support PM in Conflict Res, Participation in Impl
c. Dependent Variable: Total of EPM Attributes

Anova

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1640,743	1	1640,743	38,592	0,000a
	Residual	1020,372	24	42,515		
	Total	2661,115	25			
2	Regression	1976,205	2	988,106	33,182	0,000b
	Residual	684,91	23	29,779		
	Total	2661,115	25			

a. Predictors: (Constant), Support PM in Conflict Res
b. Predictors: (Constant), Support PM in Conflict Res, Participation in Impl
c. Dependent Variable: Total of EPM Attributes

Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
	B	Std. Error	Beta			Zero-order	Partial	Part
1 (Constant)	37,691	5,784		6,517	0,000			
Support PM in Conflict Res	7,230	1,164	0,785	6,212	0,000	0,785	0,785	0,785
2 (Constant)	26,868	5,816		4,620	0,000			
Support PM in Conflict Res	5,310	1,130	0,577	4,700	0,000	0,785	0,700	0,497
Participation in Impl	1,446	0,431	0,412	3,356	0,003	0,704	0,573	0,355

a. Dependent Variable: Total of EPM Attributes

The relevant regression equation is as follows:

(Total of EPM Attributes)y = 26,868+ (Support PM in Conslict Res)5.310 + (Participation in Impl)1.446

Table 3.5 Intercorrelation between main variables

	Total of EPM Attributes	Total of TMS Attributes	Total of SLP
Total of EPM Attributes	1	0,859**	0,812**
Total of TMS Attributes	0,859**	1	0,717**
Total of SLP	0,812**	0,717**	1

3.2.4. Hypothesis 4: Moderating effect of top management support

An ANOVA analysis was conducted to test Hypothesis 4. Since the Test of Homogeneity of Variance indicated a significant Levene Statistic value as illustrated in Table 3.6. This result did not satisfy the main assumption of the ANOVA analysis, therefore this hypothesis was sustained. The result of the analysis shown at Appendix C.

Table 3.6 Test of homogeneity of variances of ANOVA analysis of moderating effect of top management support

Test of Homogeneity of Variance

Total of SLP

Levene Statistic	df1	df2	Sig.
3,503	5	20	0,02

CHAPTER IV

DISCUSSION AND CONCLUSION

This study was designed to make a contribution to the general body of knowledge about ERP and the critical success factors in ERP implementation projects especially by focusing on the top management support and effective project management as 'main success factors' in ERP projects carried out in Turkish branches of multinational pharmaceutical companies.

4.1. Discussion

Most of the researchers studied critical success factors in ERP implementation projects, explained critical success factors by making case studies through the examination of previous research projects. However, there are limited empirical studies which attempted to operationalize the critical success factors (Robey et al., 2002). This study contributed to the existing theoretical framework by assessing two main organizational variables (Top management support and effective project management) as the most important critical success factors. In terms of the examination of the critical success factors in relation to ERP implementations, this project is a unique one in Turkey due to the fact that there are no similar studies except a limited number of case studies.

The study illustrated that top management support is the vital element for successful ERP implementation projects. The result of the study indicated significant empirical evidence compatible with the findings of previous research projects. Moreover, the present study also contributed the theoretical framework by indicating the functional role of skilled employees for ERP implementation project. The allocation of professionals which resulted as the main attribute of top management support made the biggest impact on success level of ERP implementation projects. This finding deserved the attention due to the fact that the consensus of top managers on the ERP implementation is of importance for the overall success level of projects.

Furthermore the study also illustrated the fact that top management should support the ERP implementation against numerous barriers which may arise in the company throughout the

implementation cycle. This result is of importance since it indicated that top management support should be sustainable during all implementation cycle, where the result is compatible with previous studies (Holland et al., 1999; Esteves et al., 2001).

In this study the impact of top management support on effectiveness of project management was also examined. Empirical evidence proved that top management support had a positive impact on effective project management. The study findings illustrated that supporting project management in resolution of conflicts made the biggest contribution on the effectiveness of project management. Previous studies illustrated that ERP implementation projects, conflicts among related parties participating in implementation activities and conflicts among the implementation team and external parties as well, where these conflicts may negatively affect the success of the implementation project and overall performance of the ERP system throughout the organization (Roberts and Barrar, 1992). Top managers should support project management in resolution of these conflicts by assessing their legitimate power.

One other critical success factor which has been examined in this study is effective project management. The research provided empirical evidence for the relationship between effective project management and success level of ERP projects. This result supported the findings of previous studies (Falkowski et al., 1998; Wee, 2000; Sumner, 1999). Moreover, study emphasized that the most important attribute of effective project management in ERP projects is the establishment of effective communication. This result was opposed to the findings of Sarker and Lee (2003) who concluded that communication had no correlation with success level of ERP projects, and the relevant literature.

Another finding of this study was related to the idea that project manager should also be project champion (Zhang et al., 2002; Mousseau, 1998). In this manner the study pointed out the importance of the selection of the project manager in ERP projects, where project manager should be a high level who has a good business perspective and necessary organizational skills to lead the organizational change in the course of the ERP project and market the project throughout the organization.

Although the effect of top management support on Success Level of ERP projects was also examined as a moderator, no empirical support was obtained.

4.2. Conclusion

This study is a contribution to the growing body of the literature on the critical success factors in ERP implementation and focused on two main organization factors as top management support and effective project management. It examined the relationship between top management support, effective project management and success level of ERP implementation projects took place in Turkish branches of multinational pharmaceutical companies and also examined the impact of attributes of top management support and effective project management on success level of ERP projects particularly.

The result of stepwise multiple regressions stated that two main attributes of top management support, 'allocating well – skilled people to the implementation team' and 'support implementation to comeover the barriers against implementation' were able to explain almost two third (65 %) of the variance in the success level of ERP projects. The Durbin- Watson (1,545) test indicated that outcome of the regression analysis is reliable. The Pearson product moment correlation analysis indicated that main variables of top management support and effective project management are highly correlated (0,859) and the stepwise multiple regression analysis resulted with two attributes of top management support, 'support project management in conflict resolution' and 'participation in implementation'. These variables were able to explain %74 of the variance in dependent variable of effective project management. Durbin-Watson (2,22) test also confirmed the result. The following regression analysis indicated that two main attributes of effective project management namely, 'establish effective communication' and 'project champion' were able to explain 66% percent of the variance in the success level of ERP projects. The moderating effect of top management support was not supported by the ANOVA analysis where the levene statistic (3,503) of test of homogeneity of variance did not meet the main assumption of ANOVA analysis.

In the light of this empirical evidence, we came to the conclusion that, when the senior management of the organizations provide a sustainable support to the projects with direct

participation to the implementation activities and with their willigness to allocate necessary resources, ERP projects end up with a succes where organizations gain more benefit from the implemented ERP systems. Furthermore, in the organizations where project managers can establish an effective communication and champion the ERP implementation projects, the overall performance level of ERP implementation projects would improve.

The research findings regarding the impacts of top management support and effective project management in ERP projects are providing guideliness for the companies which will implement an ERP system and also for the professionals who are working in ERP implementation business.

4.3. Limitations of the Study

There are a number of limitations that should be noted. First of all relatively small sample size was an important factor in regard to the generalization of the findings. Secondly the study has been focused on multinational companies which are operating in same industry, which also limits the generalization of the findings. This is an important subject that should be taken into account in future research projects.

APPENDIX A

QUESTIONNAIRE

Sayın Yetkili

Bu anket sadece Orhan Göçer tarafından yapılan tez çalışmasında kullanılmak üzere hazırlanmıştır. Cevaplarınız sizin izniniz dışında hiçbir üçüncü şahıs ve/veya kurumlarla paylaşılmayacak ve başka herhangi bir amaç için kullanılmayacaktır. Tez çalışmasında şirket / çalışan vb gibi bilgiler kesinlikle yer almayacak sadece toplam figürler kullanılacaktır. Çalışma detayları, çalışma bittikten sonra istenildiği takdirde katılımcılar ile paylaşılacaktır.

Bu çalışmamızda bizi desteklediğiniz için şimdiden teşekkür ederiz.

Yüksek Lisans Öğrencisi : Orhan GOCER

Tez Danışmanı : Yar. Doç. Dr. Mehmet Yahyagil

1. Genel Bilgiler (Bu kısım opsiyoneldir)		
1.	Şirket İsmi	
2.	Katılımcı ismi	
3.	Katılımcının şirketteki görevi	

	2. Üst Yönetim Desteği Soruları	Strongly Agree	Agree	Almost Agree	Almost Disagree	Disagree	Strongly Disagree
1.	Şirket Üst Yönetimi ERP Sisteminin satınalma sürecine doğrudan katılmıştır.						
2.	Şirket Üst Yönetimi ERP satınalma sürecinde ERP sistemleri ve ERP felsefesi hakkında detaylı bilgiye sahipti.						
3.	Şirket Üst Yönetimi ERP satınalma ve kurulum sürecinde gerekli ve yeterli finansal desteğin sağlanmasını onaylamıştır .						
4.	Şirket Üst Yönetimi implementasyon çalışmaları için kurulan takıma çeşitli departmanlardan ihtiyaç duyulan yetkin çalışanların katılmasını desteklemiştir.						
5.	Şirket Üst Yönetimi ERP İmplementasyonu sırasında yapılan periyodik toplantılarda sürekli yeralmıştır .						
6.	Şirket Üst Yönetimi ERP implementasyonu sürecinin tamamında implementasyonun durumu hakkında raporlar almıştır.						
7.	Şirket Üst Yönetimi implementasyon takımının sonradan oluşan her türlü ekipman, eğitim, eleman vb. İhtiyacının karşılanmasını desteklemiştir.						
8.	Şirket Üst Yönetimi ERP implementasyonu sırasında implementasyon ile ilgili şirket içinde oluşan dirençleri ve implementasyon ile ilgili şikayetleri dikkatle değerlendirmiştir.						
9.	Şirket Üst Yönetimi ERP implementasyonu ile birlikte gelen süreç ve görev değişikliklerini onaylamış ve ilgili çalışanları bu değişiklikleri uygulama konusunda desteklemiştir.						
10.	Şirket Üst Yönetimi ERP İmplementasyon çalışmaları sırasında çıkan anlaşmazlıkların çözülmesinde etkin rol oynamıştır.						

	3. Proje Yönetimi Soruları	Strongly Agree	Agree	Almost Agree	Almost Disagree	Disagree	Strongly Disagree
1.	ERP İmplementasyonu projesine üst kademe yöneticilerden birisi proje yöneticisi atanmış ve yönetici proje boyunca görev almıştır.						
2.	Proje Yönetimi projenin kapsamını implementasyon başlamadan önce belirlemiştir.						
3.	Projenin planlanmasından önce zaman ve maliyet ile ilgili çalışmalar proje yöneticisinin kendisi tarafından değil ilgili departmanların(finans, bütçe, İK vs) katılımıyla yapılmıştır.						
4.	Proje Yöneticisi, projeye kendi zamanının % 50 'den fazlasını ayırmıştır.						
5.	İmplementasyondan önce detaylı bir proje planı hazırlanmıştır.						
6.	Proje planı, implementasyondan önce şirket üst yönetimi ile paylaşılmıştır.						
7.	Proje planında toplam implementasyon süresi .....X AY olarak belirtilmiştir. (Bu kısmı sadece proje yöneticisi cevaplayacaktır)	X	X	X	X	X	
8.	Proje Yönetimi proje planını implementasyonun tüm adımlarında takip etmiştir.						
9.	Proje Yöneticisi, implementasyon süresince, gerekli gördüğü yerlerde proje planını revize etmiştir.						
10.	Proje Yöneticisi, proje süresince, planlanan – gerçekleşen karşılaştırmalarını raporlamış üst yönetime sunmuştur.						
11.	İmplementasyon bütçesi projeden önce tüm detaylarıyla hazırlanmıştır.						
12.	Proje yöneticisi implementasyon bütçesini üst yönetime sunmuş ve üst yönetim proje bütçesini onaylamıştır.						
13.	Proje yöneticisi, proje bütçesini, proje boyunca takip etmiş ve planlanan gerçekleşen raprolarını hazırlamıştır.						
14.	Implementasyon bütçesi .....X Birim Para olarak hazırlanmıştır. (Bu soruya 4. Kısımın 2. sorusu ile oranlı bir Birim Para Cinsinden bütçe değeri ile cevap verilecektir. Bu kısmı sadece proje yöneticisi cevaplayacaktır)	X	X	X	X	X	X
15.	Implementasyon takımı, şirketin değişik departmanlarından gelen çalışanların ve danışmanların oluşturduğu bir takımdı.						

16.	İmplementasyon takımı üyeleri şirketin en yetkin çalışanlarından oluşturulmuştu.						
17.	İmplementsyon takımı üyeleri, proje süresince zamanlarının % 50'sinden fazlasını implementasyon için kullanmışlardı.						
18.	İmplementasyon takımı, şirketin süreçleri ile ilgili tüm detaylara hakimdi.						
19.	İmplementasyon ekibi üyeleri ERP ile ilgili tüm eğitimlere devam etmişlerdi.						
20.	İmplementasyon ekibi üyeleri proje çalışmalarını kendi departmanlarında, kendi ofislerinde gerçekleştirmişlerdi.						
21.	İmplementasyon takımı, implementasyon süresince, sadece ihtiyaç duyulduğunda toplantılar yapmışlardır.						
22.	İmplementasyon takımı, implementasyon boyunca kendi içinde / diğer ilgili partiler ile düzenli çalışma toplantıları gerçekleştirmişlerdir.						
23.	Şirketin geri kalanı, implementasyon hakkında düzenli olarak bilgilendirilmiştir.						

	4. Proje Performansı	Strongly Agree	Agree	Almost Agree	Almost Disagree	Disagree	Strongly Disagree
1.	Toplam İmplementasyon Süresi .....X AY olarak gerçekleşmiştir. . (Bu kısmı sadece proje yöneticisi cevaplayacaktır)	X	X	X	X	X	X
2.	Toplam İmplementasyon maliyeti .....X BİRİM PARA olarak gerçekleşmiştir. (Bu soruya 3. Kısımın 16. sorusu ile aynı formatta cevap verilmelidir . Bu kısmı sadece proje yöneticisi cevaplayacaktır))	X	X	X	X	X	X
	İmplementasyondan Sonra:	X	X	X	X	X	X
3.	Şirket süreçlerin genelinde kullanılan ortak ve tek bir sisteme kavuşmuştur .						
4.	Şirket süreçlerinde gözle görülür bir iyileşme sağlanmıştır.						
5.	Şirket çalışanlarının geneli için , ihtiyaç duyulan bilgiye ulaşmak kolaylaşmıştır.						
6.	Operasyon maliyetlerinde ölçülebilir bir azalma gerçekleşmiştir.						
7.	Şirketin kilit operasyonlarında, operasyon sürelerinde ölçülebilir bir azalma gerçekleştirilmiştir..						
8.	Şirket yönetimi, sistemi / sistem çıktılarını (raporlar vb) planlama ve karar verme süreçlerinde kullanmaktadır.						

APPENDIX B

ITEM LABEL CODING OF THE SURVEY

2. Üst Yönetim Desteği Soruları

1.	Şirket Üst Yönetimi ERP Sisteminin satınalma sürecine doğrudan katılmıştır.	TMS.1
2.	Şirket Üst Yönetimi ERP satınalma sürecinde ERP sistemleri ve ERP felsefesi hakkında detaylı bilgiye sahipti.	TMS.2
3.	Şirket Üst Yönetimi ERP satınalma ve kurulum sürecinde gerekli ve yeterli finansal desteğin sağlanmasını onaylamıştır .	TMS.3
4.	Şirket Üst Yönetimi implementasyon çalışmaları için kurulan takıma çeşitli departmanlardan ihtiyaç duyulan yetkin çalışanların katılmasını desteklemiştir.	TMS.4
5.	Şirket Üst Yönetimi ERP İmplementasyonu sırasında yapılan periyodik toplantılarda sürekli yeralmıştır .	TMS.5
6.	Şirket Üst Yönetimi ERP implementasyonu sürecinin tamamında implementasyonun durumu hakkında raporlar almıştır.	TMS.6
7.	Şirket Üst Yönetimi implementasyon takımının sonradan oluşan her türlü ekipman, eğitim, eleman vb. İhtiyacının karşılanmasını desteklemiştir.	TMS.7
8.	Şirket Üst Yönetimi ERP implementasyonu sırasında implementasyon ile ilgili şirket içinde oluşan dirençleri ve implementasyon ile ilgili şikayetleri dikkatle değerlendirmiştir.	TMS.8 (R)
9.	Şirket Üst Yönetimi ERP implementasyonu ile birlikte gelen süreç ve görev değişikliklerini onaylamış ve ilgili çalışanları bu değişiklikleri uygulama konusunda desteklemiştir.	TMS.9
10.	Şirket Üst Yönetimi ERP İmplementasyon çalışmaları sırasında çıkan anlaşmazlıkların çözülmesinde etkin rol oynamıştır.	TMS.10

3. Proje Yönetimi Soruları

1.	ERP İmplementasyonu projesine üst kademe yöneticilerden birisi proje yöneticisi atanmış ve yönetici proje boyunca görev almıştır.	EPM.1
2.	Proje Yönetimi projenin kapsamını implementasyon başlamadan önce belirlemiştir.	EPM.2
3.	Projenin planlanmasından önce zaman ve maliyet ile ilgili çalışmalar proje yöneticisinin kendisi tarafından değil ilgili departmanların(finans, bütçe, İK vs) katılımıyla yapılmıştır.	EPM.3 (R)

4.	Proje Yöneticisi, projeye kendi zamanının % 50 'den fazlasını ayırmıştır.	EPM.4
5.	İmplementasyondan önce detaylı bir proje planı hazırlanmıştır.	EPM.5
6.	Proje planı, implementasyondan önce şirket üst yönetimi ile paylaşılmıştır.	EPM.6
7.	Proje planında toplam implementasyon süresi .....X AY olarak belirtilmiştir. (Bu kısmı sadece proje yöneticisi cevaplayacaktır)	EPM.7
8.	Proje Yönetimi proje planını implementasyonun tüm adımlarında takip etmiştir.	EPM.8
9.	Proje Yöneticisi, implementasyon süresince, gerekli gördüğü yerlerde proje planını revize etmiştir.	EPM.9
10.	Proje Yöneticisi, proje süresince, planlanan – gerçekleşen karşılaştırmalarını raporlamış üst yönetime sunmuştur.	EPM.10
11.	İmplementasyon bütçesi projeden önce tüm detaylarıyla hazırlanmıştır.	EPM.11
12.	Proje yöneticisi implementasyon bütçesini üst yönetime sunmuş ve üst yönetim proje bütçesini onaylamıştır.	EPM.12
13.	Proje yöneticisi, proje bütçesini, proje boyunca takip etmiş ve planlanan gerçekleşen raprolarını hazırlamıştır.	EPM.13
14.	Implementasyon bütçesi .....X Birim Para olarak hazırlanmıştır. (Bu soruya 4. Kısımın 2. sorusu ile oranlı bir Birim Para Cinsinden bütçe değeri ile cevap verilecektir. Bu kısmı sadece proje yöneticisi cevaplayacaktır)	EPM.14
15.	Implementasyon takımı, şirketin değişik departmanlarından gelen çalışanların ve danışmanların oluşturduğu bir takımdı.	EPM.15
16.	İmplementasyon takımı üyeleri şirketin en yetkin çalışanlarından oluşturulmuştu.	EPM.16
17.	İmplementsyon takımı üyeleri, proje süresince zamanlarının % 50'sinden fazlasını implementasyon için kullanmışlardı.	EPM.17 (R)
18.	İmplementasyon takımı, şirketin süreçleri ile ilgili tüm detaylara hakimdi.	EPM.18
19.	İmplementasyon ekibi üyeleri ERP ile ilgili tüm eğitimlere devam etmişlerdi.	EPM.19
20.	İmplementasyon ekibi üyeleri proje çalışmalarını kendi departmanlarında, kendi ofislerinde gerçekleştirmişlerdi.	EPM.20 (R)
21.	İmplementasyon takımı, implementasyon süresince, sadece ihtiyaç duyulduğunda toplantılar yapmışlardır.	EPM.21 (R)
22.	İmplementasyon takımı, implementasyon boyunca kendi içinde / diğer ilgili partiler ile düzenli çalışma toplantıları gerçekleştirmişlerdir.	EPM.22
23.	Şirketin geri kalanı, implementasyon hakkında düzenli olarak bilgilendirilmiştir.	EPM.23

4. Proje Performansı

1.	Toplam İmplementasyon Süresi .....X AY olarak gerçekleşmiştir. . (Bu kısmı sadece proje yöneticisi cevaplayacaktır)	SLP.1
2.	Toplam İmplementasyon maliyeti .....X BİRİM PARA olarak gerçekleşmiştir. (Bu soruya 3. Kısımın 16. sorusu ile aynı formatta cevap verilmelidir . Bu kısmı sadece proje yöneticisi cevaplayacaktır))	SLP.2
	İmplementasyondan Sonra:	
3.	Şirket süreçlerin genelinde kullanılan ortak ve tek bir sisteme kavuşmuştur .	SLP.3
4.	Şirket süreçlerinde gözle görülür bir iyileşme sağlanmıştır.	SLP.4
5.	Şirket çalışanlarının geneli için , ihtiyaç duyulan bilgiye ulaşmak kolaylaşmıştır.	SLP.5
6.	Operasyon maliyetlerinde ölçülebilir bir azalma gerçekleşmiştir.	SLP.6
7.	Şirketin kilit operasyonlarında, operasyon sürelerinde ölçülebilir bir azalma gerçekleştirilmiştir..	SLP.7
8.	Şirket yönetimi, sistemi / sistem çıktılarını (raporlar vb) planlama ve karar verme süreçlerinde kullanmaktadır.	SLP.8

(R) Denotes reverse coded items

APPENDIX C

ANOVA ANALYSIS FOR HYPOTHESIS FOUR

Oneway

Test of Homogeneity of Variances
Total of SLP

Levene Statistic	df1	df2	Sig.
3,503	5	20	,020

ANOVA

Total of SLP

		Sum of Squares	df	Mean Square	F	Sig.
Between Groups	(Combined)	16529,170	5	3305,834	143,311	,000
	Linear Term Unweighted	24,364	1	24,364	1,056	,316
	Weighted	20,711	1	20,711	,898	,355
	Deviation	16508,459	4	4127,115	178,915	,000
Within Groups		461,350	20	23,068		
Total		16990,520	25			

Post Hoc Tests

Multiple Comparisons
Dependent Variable: Total of SLP

	(I) Company Number	(J) Company Number	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
Tukey HSD	1,00	2,00	46,4800	3,03760	,000	36,9320	56,0280
		3,00	-6,4200	3,22186	,380	-16,5471	3,7071
		4,00	-11,5200	3,03760	,013	-21,0680	-1,9720
		5,00	-15,1200	3,50752	,004	-26,1450	-4,0950
		6,00	41,9900	3,22186	,000	31,8629	52,1171
	2,00	1,00	-46,4800	3,03760	,000	-56,0280	-36,9320
		3,00	-52,9000	3,22186	,000	-63,0271	-42,7729
		4,00	-58,0000	3,03760	,000	-67,5480	-48,4520
		5,00	-61,6000	3,50752	,000	-72,6250	-50,5750
		6,00	-4,4900	3,22186	,730	-14,6171	5,6371
	3,00	1,00	6,4200	3,22186	,380	-3,7071	16,5471

		2,00	52,9000	3,22186	,000	42,7729	63,0271
		4,00	-5,1000	3,22186	,618	-15,2271	5,0271
		5,00	-8,7000	3,66825	,213	-20,2302	2,8302
		6,00	48,4100	3,39614	,000	37,7351	59,0849
	4,00	1,00	11,5200	3,03760	,013	1,9720	21,0680
		2,00	58,0000	3,03760	,000	48,4520	67,5480
		3,00	5,1000	3,22186	,618	-5,0271	15,2271
		5,00	-3,6000	3,50752	,904	-14,6250	7,4250
		6,00	53,5100	3,22186	,000	43,3829	63,6371
	5,00	1,00	15,1200	3,50752	,004	4,0950	26,1450
		2,00	61,6000	3,50752	,000	50,5750	72,6250
		3,00	8,7000	3,66825	,213	-2,8302	20,2302
		4,00	3,6000	3,50752	,904	-7,4250	14,6250
		6,00	57,1100	3,66825	,000	45,5798	68,6402
	6,00	1,00	-41,9900	3,22186	,000	-52,1171	-31,8629
		2,00	4,4900	3,22186	,730	-5,6371	14,6171
		3,00	-48,4100	3,39614	,000	-59,0849	-37,7351
		4,00	-53,5100	3,22186	,000	-63,6371	-43,3829
		5,00	-57,1100	3,66825	,000	-68,6402	-45,5798
Scheffe	1,00	2,00	46,4800	3,03760	,000	35,2967	57,6633
		3,00	-6,4200	3,22186	,567	-18,2817	5,4417
		4,00	-11,5200	3,03760	,041	-22,7033	-,3367
		5,00	-15,1200	3,50752	,015	-28,0334	-2,2066
		6,00	41,9900	3,22186	,000	30,1283	53,8517
	2,00	1,00	-46,4800	3,03760	,000	-57,6633	-35,2967
		3,00	-52,9000	3,22186	,000	-64,7617	-41,0383
		4,00	-58,0000	3,03760	,000	-69,1833	-46,8167
		5,00	-61,6000	3,50752	,000	-74,5134	-48,6866
		6,00	-4,4900	3,22186	,851	-16,3517	7,3717
	3,00	1,00	6,4200	3,22186	,567	-5,4417	18,2817
		2,00	52,9000	3,22186	,000	41,0383	64,7617
		4,00	-5,1000	3,22186	,772	-16,9617	6,7617
		5,00	-8,7000	3,66825	,379	-22,2052	4,8052
		6,00	48,4100	3,39614	,000	35,9067	60,9133
	4,00	1,00	11,5200	3,03760	,041	,3367	22,7033
		2,00	58,0000	3,03760	,000	46,8167	69,1833
		3,00	5,1000	3,22186	,772	-6,7617	16,9617
		5,00	-3,6000	3,50752	,954	-16,5134	9,3134
		6,00	53,5100	3,22186	,000	41,6483	65,3717
	5,00	1,00	15,1200	3,50752	,015	2,2066	28,0334
		2,00	61,6000	3,50752	,000	48,6866	74,5134
		3,00	8,7000	3,66825	,379	-4,8052	22,2052
		4,00	3,6000	3,50752	,954	-9,3134	16,5134
		6,00	57,1100	3,66825	,000	43,6048	70,6152
	6,00	1,00	-41,9900	3,22186	,000	-53,8517	-30,1283
		2,00	4,4900	3,22186	,851	-7,3717	16,3517
		3,00	-48,4100	3,39614	,000	-60,9133	-35,9067
		4,00	-53,5100	3,22186	,000	-65,3717	-41,6483
		5,00	-57,1100	3,66825	,000	-70,6152	-43,6048

* The mean difference is significant at the .05 level.

Homogeneous Subsets

Total of SLP

	Company Number	N	Subset for alpha = .05			
			1	2	3	4
Tukey HSD	2,00	5	-30,6000			
	6,00	4	-26,1100			
	1,00	5		15,8800		
	3,00	4		22,3000	22,3000	
	4,00	5			27,4000	
	5,00	3			31,0000	
	Sig.		,753	,412	,138	
Duncan	2,00	5	-30,6000			
	6,00	4	-26,1100			
	1,00	5		15,8800		
	3,00	4		22,3000	22,3000	
	4,00	5			27,4000	27,4000
	5,00	3				31,0000
	Sig.		,191	,067	,140	,291
Scheffe	2,00	5	-30,6000			
	6,00	4	-26,1100			
	1,00	5		15,8800		
	3,00	4		22,3000	22,3000	
	4,00	5		27,4000	27,4000	
	5,00	3			31,0000	
	Sig.		,866	,073	,276	

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 4,186.
b The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

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