CRITICAL SUCCESS FACTORS IN ENTERPRISE RESOURCE PLANNING (ERP) SYSTEMS IMPLEMENTATION

An Applied Study on Manufacturing Companies in Jordan That Adopted Baan LN. ERP System

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This Thesis is Submitted in Partial Fulfillment of the Master's Degree In Business Administration

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Authorization:

I, Shatha Yousef, authorize the Middle East University for Graduate Studies to provide soft and hard copies of this study to libraries, organization, establishments and institution concerned in academic research upon request.

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This thesis, titled *"The Critical Success Factors in Enterprise Resource Planning (ERP) System Implementation"*, has been discussed and approved on / / .

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My extended gratitude also for the studied companies staffs for their cooperation and to those who assisted me in the accomplishment of this study.

Thank you,,,

Shatha Yousef

Dedications

A very special dedication for my loving, caring and supporting family…

For my friends and colleagues…

I dedicate this work…

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CRITICAL SUCCESS FACTORS IN ENTERPRISE RESOURCE PLANNING (ERP) SYSTEMS IMPLEMENTATION

An Applied Study on Manufacturing Companies in Jordan That Adopted Baan LN. ERP System

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Abstract:

The reliability and affectivity of information systems have being proved since their early beginning in the mid of last century and encouraged more organizations to systemize their work processes which created an increasing demand on those systems. However, deficiencies in legacy systems mainly in terms of coordination with each others and providing real-time accurate data have been a constant stimulator for software programmers to develop more advanced systems that can satisfy market's demands.

ERP comes as the last generation of materials-related management systems that were existed in 1960's and concerned mainly in improving warehouse, materials and production management. Those systems have been further enhanced with more applications to maximize the served operations which eventually leaded to the born of ERP systems. ERP are full integrated systems which grant a web-based linkage of all organization's operations the thing that greatly improve the quality, accuracy, timing, flow and access of data among users. These fundamental improvements have been translated into substantial benefits on operational, managerial and financial levels in organizations that have successfully implement then properly utilize an ERP system.

So, what hold organization from implementing an ERP system?

Two major obstacles rise against an ERP system adaptation decision; the huge magnitude of costs and the high failure rate. ERP is a very costly project that requires the deployment of huge resources throughout its life cycle. Starting by the expensive software itself to the training courses, external consultants, periodic maintenance, annual licensing, upgrading and so forth. From the other hand, statistics show a very high failure rate among ERP implementation projects that exceed 90%. These failure grades from minor failures in meeting the scheduled implementation time and budget to much serious complications like losing market share or even bankruptcy as happened in some cases. Both reasons together consist a solid barrier toward ERP implementation and rise doubts the real feasibility of theses systems.

For that sake, researchers are giving more attention to study the factors that impact ERP success/failure in attempt to increase certainty and enable businesses to enjoy its benefits at minimal risks. This study will target the same objectives by studying the most critical factors that impact ERP implementation in Jordanian companies due to the fact that only few studies have been handled this issue in Jordan.

Industrial sector has been perceived as the most suitable sector to apply this study to include a wider variety of functions comparing with other sectors; hence, more need for integration. For this sector, Baan LN. system has been ranked as number one ERP system by Gartner Group. Thus, Jordanian industrial companies that implemented Baan LN. system will consist the population of this study. These companies as per Infor's agent in Jordan are: Middle East Complex for Eng., Electronics and Heavy Industries PLC, International Tobacco and Cigarettes Co and Pharma International.

Factors considered in the study have been determined after an extensive reviewing for the available literature and previous studies. These factors have been divided into three main categories: managerial factors including project plan and vision, system selection and top management support; project factors including project management, project champion, teamwork composition and vendor support and organizational factors including business process reengineering, communication, user training and education and organizational resistance management.

To study the impact of these factors on ERP implementation, survey methodology has been chosen and a 56-questions questionnaire has been developed. A Simple t test for the collected data showed a significant relation between the studied factors and the success of ERP implementation success. However, a Multi regression test showed that organizational factors have the greater impact on ERP implementation success.

العوامل الحرجة في نجاح تطبيق نظام تخطيط موارد المؤسسة

دراسة تطبيقية على الشركات الصناعية الاردنية التي طبقت نظام .Baan LN

اعداد:

شذا حسين حسن يوسف

اشراف:

الاستاذ الدكتور ياسر العدوان

ملخص:

منذ بدايتها في خمسينيات القرن الماضي، اثبتت انضمة المعلومات فعالية عالية في مجالات الأعمال لتصبح أحد أهم ادوات الإدارة الحديثة. مع تزايد الإدراك لأهمية هذه الأنظمة، تتابع مزودوها بتحسينها وتطويرها إستجابة لمتطلبات السوق ورفع مستوى اداء المؤسسات وتحكمها في عملياتها المختلفة.

نظام تخطيط موارد المؤسسة او(ERP System) هو أحدث هذه الانظمة حيث ظهر في ستينيات القرن الماضي بعد سلسلة من التعديلات على أنظمة سابقة إهتمت تحديداً بإدارة المستودعات وخطط الإنتاج. هذه التحسينات إعتمدت أساسا على إضافة تطبيقات لتشمل باقي عمليات المؤسسة كالمبيعات والمالية وغيرها. إستطاعت تكنولوجيا المعلومات من خلال (ERP) تحقيق أعلى مستويات في خدمة جميع عمليات الشركة في نظام واحد وربطها بقاعدة معلومات مركزية مما حسن بشكل كبير دقة وسرعة إنتقال وتبادل المعلومات بين مستخدمي هذا النظام .وقد حقق هذا النظام منافع كبيرة لشركات التي طبقته وعلى مستويات عدة كالإدارية ، المالية والتشغيلية .

ورغم كل هذه المنافع يبقى هنالك عقبتان رئيسيتان لتبني هذا النظام :

1- الكلفة العالية : التي بالإضافة الى السعر العالي للنظام نفسه ، تشمل ايضاً البرامج التدريبية ، والإستشارات الخارجية ، الصيانة الدورية ورخص السنوية له .

2- نسبة الفشل العالية التي قدرت بما يزيد عن 90% بين الشركات التي حاولت تطبيق هذا النظام على مستوى العالم وتتراوح درجة الفشل من تخطي الجدول الزمني والميزانية الموضوعة له الى مضاعفات أخطر كخسارة الحصة السوقية أو حتى الإفلاس كما حصل مع بعض الشركات .

هذه المفارقة الكبيرة بين منافع النظام ومخاطره خلقت الحاجة الى دراسات معمقة حول العوامل التي تؤثر في نجاح أو فشل تطبيقه وتسعى هذه الدراسة الى نفس الهدف من خلال تحديد أهم العوامل المذكورة في دراسات

سابقة ودراسة تأثيرها على نجاح تطبيق النظام في الشركات الصناعية الأرنية. و قد قسمت العوامل المدروسة الى ثلاثة مجموعات:

- العوامل الادرية: خطة و رؤية المشروع، اختيار النظام و دعم الادارة العليا.
- عوامل المشروع: ادارة المشروع، قائد المشروع، فريق العمل و دعم المزود.
- العوامل التنظيمية: اعادة هندسة اجراءات العمل، التواصل، التدريب و ادارة مقاومة المؤسسة.

وقد تم إختيار نظام (Baan LN) بإعتباره أفضل نظام في القطاع الصناعي حيث تم توزيع الاستبيانات على الشركات الاردنية التي تطبق هذا النظام وهي: الشرق الاوسط للالكترونيات، الدولية للسجائر و الدولية للادوية.

وقد توصلت الدراسة بعد تحليل النتائج باستعمال اختبار t الى وجود علاقة بين العوامل الإدارية ، المشروع والتنظيمية المدروسة ونجاح تطبيق النظام . بينما وجد من خلال استخدام اختبار الانحدار المتعدد المتدرج ان العوامل التنظيمية هي الاهم.

Chapter One: *Introduction*

This chapter displays a general background about the study subject and includes:

1.1. Introduction.
1.2. The Study Problem and Questions
1.3. The Study Hypotheses.
1.4. The Study Objectives
1.5. The study Importance.
1.6. The Study Limits
1.7. The Study Limitations
1.8. The Study Contribution

1.1. Introduction

In nowadays businesses, the efficiency in which organizations can manage their processes and flow of data has exceeded being a competitive advantage to be a condition for their survival in certain cases. Information systems were and still an essential tool that help organizations to enhance their operations and apply more control on the quality, accuracy and timing of data. For that reason, the reliance on these systems has been magnified over the last few decades and extended to cover every single function. Todd & Benbasat (2000) state that" The influence of IT on decision making is, in many ways, synonymous with the impact of IT on the success or failure of the organization as a whole"

Enterprise Resource Planning (ERP) systems are a new class of software that tend to streamline organizations' processes and support their decisions making. This concept is not new in information management though and ERP systems themselves are an extension for a series of enterprise systems that primarily concerned in inventory and materials management such as Material Requirement Planning (MRP) then Manufacturing Resources Planning (MRPII). However, these systems and other legacy systems were stand-alone systems that are poorly integrated with each others leading to an inaccurate, duplication, slow and hard access to the data which negatively impact organization's performance and response. The insufficiency of legacy systems typically translates into inefficient and costly processes. ERP systems, on the other hand, overcomes all these problems with a cross-functional integrated design. Seddon and Willcocks (2003) stated that "ERP systems are different from legacy systems in that organizations use ERP to integrate enterprise-wide information supporting financial, human resources, manufacturing, logistics, sales and marketing functions" making it the de-facto standard for the replacement of legacy systems in many businesses (Parr & Shanks, 2000).

The unique modular design of ERP systems with a web-based interface have proved exceptional improvements in processes operating in individual functional areas, integrating all organizations' processes in a single database; enhance the quality, accuracy and timing of data. Kumar et al (2000) define Enterprise Resource Planning (ERP) systems as "configurable information systems packages that integrate information and information-based processes within and across functional areas in an organization" the thing that "helps organizations deal with the supply chain, receiving, inventory management, customer order management, production planning, shipping, accounting, human resource management and other business functions" (Somers and Nelson, 2003). ERP impact exceeds the operational improvements to financial benefits where adopting organizations often witness improvements in some of their financial indicators like ROI as well as increase in revenue and reduce in operating cost.

In order to gain these benefits, organizations have to allocate plenty of resources, capabilities, efforts, time and survive a challenging implementation process which found to be a very risky and complicated one. Wognum et al (2004) stated that implementing the ERP system is not an easy job due to the fact that so many aspects must be managed and controlled on the same time. Furthermore, ERP systems are often associated with many changes on both, operational and structural levels. Such changes should be

carefully and gradually done to avoid any organizational resistance and ensure a smooth implementation and utilization for the system. Evidences actually show a very high failure rate in ERP projects either totally by terminating it or partially by exceeding the allocated budget, time or not matching the expected benefits.

Doubts about ERP feasibility have been raised therefore and managements found it too hard to justify the employing of such magnitudes of resources in a system under this high failure rate. Considering the substantial benefits reaped, ERP implementation is given much attention and studies are being conducting to identify the major success and failure factors in an ERP implementation project. By addressing these factors, organizations as well as vendors hope to make ERP implementation a smoother and more secure process rather than an obstacle toward its diffusion and progress.

1.2. The Study Problem and Questions:

ERP is a very promising system that tends to integrate and streamline all organization's processes. Indeed, studies record many outstanding benefits of ERP systems in terms of inventory, planning, revenues, lead time, information accuracy/timing, decision support …etc. Organizations seemed to realize the value of ERP systems in early stages and tremendously invested in one shortly after being represented in 1990's. Davenport (1998) stated that in the mid-1990's, businesses around the world were spending approximately $10 billion per year on Enterprise Resource Planning Systems and about the same amount on consultants to install these systems.

However, ERP system implementation has never been an easy job. The associated risks are often high and widely vary due to the multi-dimensional nature of the system that crosses all functional areas in many levels. Inadequate resources, poor planning, unqualified team, system customization and organizational resistance are some of problems that typically faced in ERP project and seriously impact their success. As a matter of fact, evidences indicate a high failure ratio in ERP implementation projects. According to The Gartner Group, 70% of all ERP projects fail to be fully implemented even after three years (Gillooli, 1998) either partially or completely. Moreover, 90% of ERP implementations end up late or over budget and 67% of enterprise application initiatives could be considered negative or unsuccessful (Boston Consulting Group, 2000)

ERP projects' failure grades from minor dissatisfactions on certain functions or a slight exceed on allocated budget/duration to much more serious and sometime fetal consequences. One of major failure cases recorded because of ERP was with Hershey Foods Corporation in 1999 that faced a 19% drop in 3rd-quarter profits and a 29% increase in inventories over the previous year due to order processing problems caused by faulty $112 million ERP implementation (Stedman, 1999). As result, Hershey's stock price dell by a third and the firm lost market share to Mars and Nestle (Severance & Passino, 2002) and suffered a 3% permanent decrease in market share from this experience (Sutton, 2003). Another case was with Miller Industries who reported a $3.5 million operating loss in the 4th quarter of 1999 due to the costs and inefficiencies of its ERP system, while WWGraiger Inc. reported a $11 million reduction in operating earnings from its improper ERP implementation (Gilbert, 1999).

Being a part pf these global failure figures and taking in consideration the local culture that likely associated with a high resistance for changes, implementing ERP systems in Jordanian companies is as challenging as other countries if not more.

Considering the tremendous magnitude of expenditures, capabilities and efforts are allocating on ERP projects yearly, studies have to be conducted to identify factors that may increase certainty in ERP project and enhance their success.

Hence, this study attempts to answer the below questions:

- Has the chosen ERP system for this study (Baan LN.) been implemented successfully in the Jordanian companies that adopted it?

- Is there a significant relationship between managerial factors (Project plan and vision, system selection and top management support) and the success of ERP system implementation?

- Is there a significant relationship between project factors (project management, project champion, teamwork and composion and vendor support) and the success of ERP system implementation?

- Is there a significant relationship between organizational factors (business process reengineering, communication, user training and education and organizational resistance control) and the success of ERP system implementation?

1.3. The Study Hypotheses:

Further to the study's problem and questions, the study's hypotheses will be as below:

H0-1: There is no significant relationship between managerial factors (Project plan and vision, system selection and top management support) and the success of ERP system implementation at level ($\alpha \geq 0.05$).

H0-2: There is no significant relationship between project factors (project management, project champion, teamwork and composition and vendor support) and the success of ERP system implementation at level ($\alpha \geq 0.05$).

H0-3: There is no significant relationship between organizational factors (business process reengineering, communication, user training and education and organizational resistance management) and the success of ERP system implementation at level ($\alpha \geq 0.05$).

1.4. The Study Objectives

In light of the questions and problem that have been discussed above, this study will aim the followings:

1. Enhance awareness about ERP systems among Jordanian companies.
2. Examine the obstacles that face the implementation process of an ERP system in Jordanian companies.
3. Unfold factors that lead to an ERP implementation success or failure in Jordanian companies.
4. Examine and analyze the impact of these factors on the ERP implementation process.
5. Propose the most suitable framework for ERP implementation according the results.

1.5. The Study Importance:

In successful ERP projects, the adopting organizations witnessed substantial improvements in their performance, affectivity and revenues. Efraim Turban and Jay E. Arason (2002, page 332) stated that "companies have been successful in integrating several hundreds of applications using ERP software, saving millions of dollars and significantly increasing customer satisfaction. Moreover, by using ERP a company discovers all the "dusty corners" of its business". However, the implementation of ERP systems is not easy and figures show very high failure ratio burden organizations with serious losses or even fetal as it was the case with Fox-Meyer Drug that referred its bankruptcy to an ERP system (Davenport, 1998).

Considering the huge resources being invested in ERP systems worldwide for the sake of these benefits and that has been estimated to be $10.6 million according to a survey by Meta Group included 63 companies (Stein, 1999) from one hand, and the high failure ration of their implementation from the other hand, together urge the necessity for a deeper study for the different factors that may lead to the success/failure of the implementation process.

This study tends to study these factors on ERP projects in Jordan to raise awareness about the importance of these systems among Jordanian companies, help them to justify the required resources and enjoy their benefits at minimal risks.

1.6. The Study Limits

This study will be applied within the following limits:

1.6.1. The study will include three Jordanian manufacturing organizations that are currently employing a Baan-ERP system which are:
- Middle East Complex for Eng., Electronics and Heavy Industries PLC

- Pharma International Co.

- International Tobacco and Cigarettes Co.

1.6.2. The study will take a place on the period between 03/2009 until 01/2010

1.7. The Study Limitations

The researcher faced the following limitations:

- There was no governmental, official or even certified party to refer back to for related data and statistics.

- Limited available studies have applied on Arab countries.

1.8. The Study Contribution

Although ERP studies are not new in character or scope, and there are many fine studies conducted by fine scholars. They differ in focus and interpretations. They all seek to understand the functioning of ERP and streamlining the concept and its applications. The various studies conducted in this area are commonly dealt with corporations' environment, internal operations, implementation processes and the functioning of ERP system. The intention of almost all studies is understand, interpretate, rationalize and provide solutions to standing issues in a given corporations or environment.

Neither this study nor its focus on ERP differs much. What makes this research different is focus and corporate environment. The study is conducted in a progressive yet developing country, namely, Jordan.

The environment in which corporations operate and the variables that impede implementations and success factors are the core of this research .So far the researcher found no study in Jordan that deals with ERP implementation processes. As a matter of fact rarely one finds a study conducted on any Arab corporations. No rigorous knowledge yet appeared as to the critical factors of success /failure of ERP implementation process in Jordanian corporations

ERP system; thus, is a new venture for manufacturing companies in Jordan, and yet no study on ERP success /failure, implementation process, capabilities exist. This alone invites even more research in this area, and serves corporate strategic orientation. This research constitutes an opening stage for further understanding of the ERP operations and may provide answers as to the critical factors of ERP success in Jordan Corporations which are yet to be revealed.

Chapter Two: *Literature Review and Previous Studies.*

In this chapter, related literature and pervious studies will be reviewed and discussed. The covered points will be:

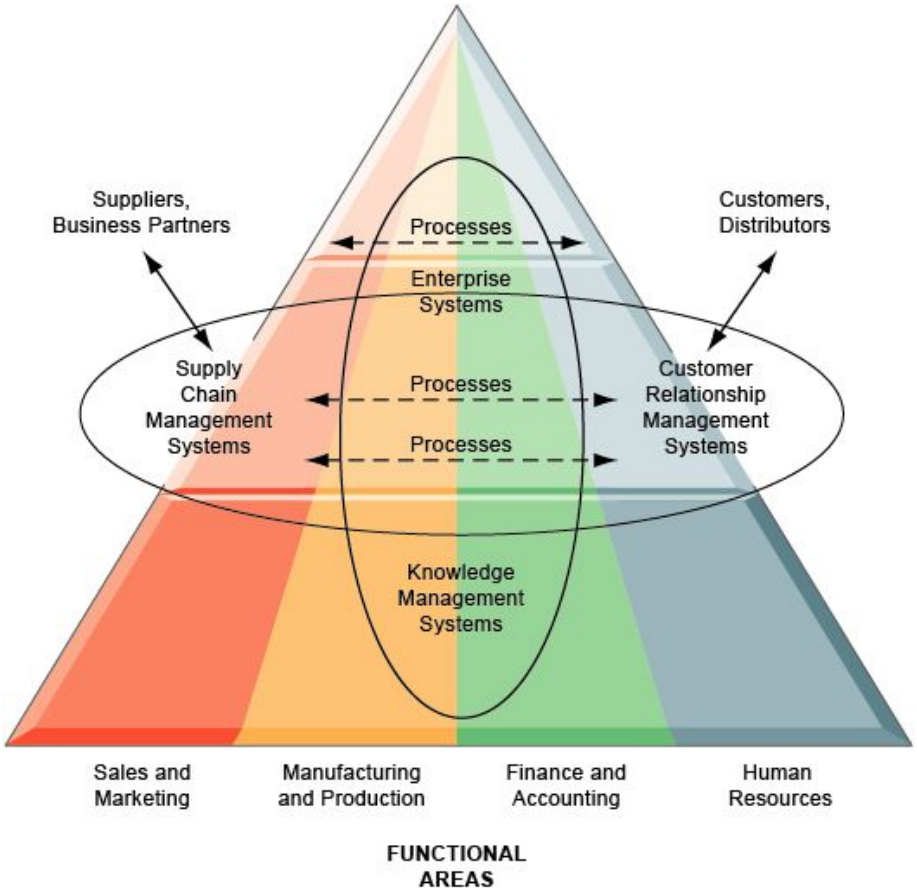
2.14. **Enterprise Information Systems.**
2.15. **ERP Evolution.**
2.16. **ERP Definition**
2.17. **ERP Adaptation Motivations.**
2.18. **ERP Life Cycle**
2.19. **Benefits of ERP.**
2.20. **Cost of ERP**
2.21. **ERP Modules**
2.22. **ERP Implementation Risks**
2.23. **Definition of ERP Success**
2.24. **ERP Value Sustenance.**
2.25. **Critical Success Factors**

2.1. Enterprise Information Systems:

The utilization of information systems in business is not new. With a humble start in the mid of last century in terms of recording and saving data to a more critical and advanced role in decision making support, organizing the flow of data, streamlining processes and so forth. O'Brien (2000) stated that "An information system uses the resources of people, hardware, software, data and networks to perform input, processing, output, storage and control activities". Nowadays, a variety of systems have been developed to serve and support the different functional areas within organization. Laudon and Laudon (2007) define these systems as "systems that span functional areas, focus on executing business processes across the business firm, and include all levels management" and divided them into four major applications are (Figure 2-1):

- Supply Chain Management Systems
- Customer Relationship Management Systems
- Knowledge Management Systems
- Enterprise Systems

Figure 2-1: Enterprise Application Architecture.



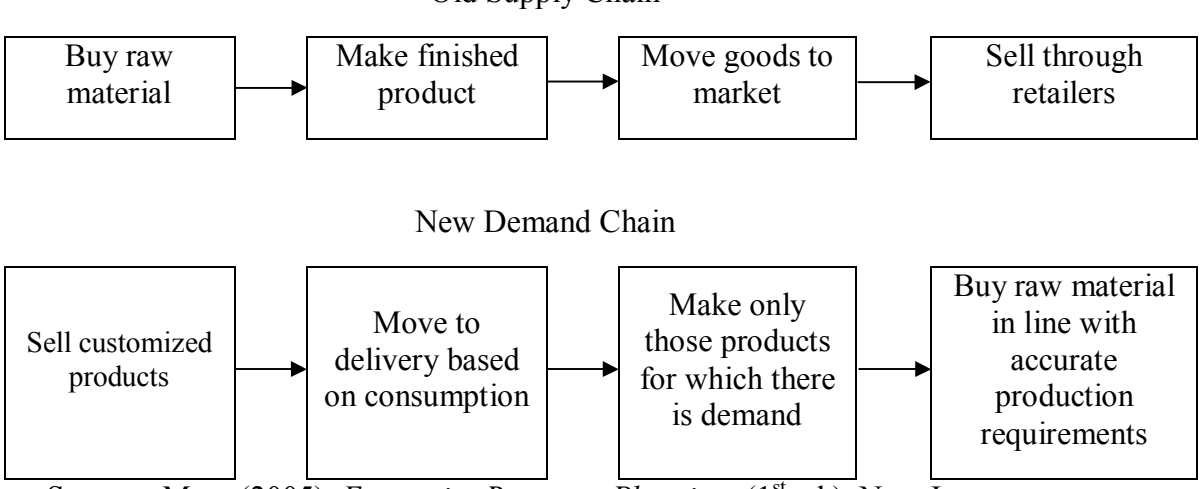
Source: Laudon, Kenneth C and Laudon, Jane P, (2006). *Management Information Systems: Managing the Digital Firm* (9th ed,), New Jersey: Prentice Education, Inc.(P 60)

2.1.1. Supply Chain Management Systems:

Supply chain refers to the series of steps a product or service goes through from creation to delivery to users. Managing this chain has been a serious challenge yet a competitive advantage for organizations when achieved. Sumner (2005) stated that Supply Chain Management is the planning and control of the flow of goods and services, information and money through the supply chain from the acquisition of raw materials to the final product in the hands of the customers. For that reason, organizations are paying more attention to their supply chains and employ substantial investments to improve its flow. "In a 2003 survey, more than 85% of senior executives stated that improving their firm's supply-chain performance was a top priority" (Wheelen & Hunger, 2008 page 129).

In old supply chain, the trend was to first manufacture then sells the on-hand inventory which typically associated with high inventory costs, insufficient stock management, long product's life cycle and late delivery. However, new supply chain depends basically on improving the information flow hence the cooperation and consistence of processes among all chain's parties to enhance the overall performance (Figure 2-2). In new supply chains therefore, companies depend on information about customers' needs to set their production plans and coordinate with suppliers.

Figure (2-2): Transition from the old Supply Chain to the new Demand Chain

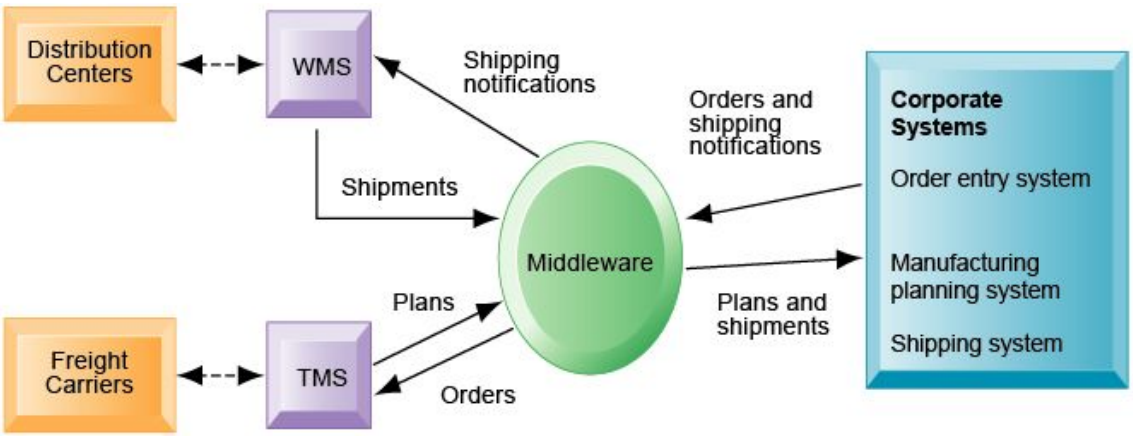


Sumner, Mary (2005). *Enterprise Resource Planning,* (1st ed,), New Jersey: Prentice-Hall, Inc. (P 134)

Information system played a key role in this regard by developing specialized systems for supply chain management that" involve many activities such as purchasing, materials handling, production planning and control, and distribution and delivery" (Turban and Aronson, 2001 page 323). Laudon and

Laudon (2006) illustrates a supply management system in figure (2-3) where the Transportation Management System (TMS) examines the freight rate and availability based on customers orders and works with Warehouse Management System (WMS) to control the flow and distribution of goods accordingly. These systems tend to create linkages among all chain's parties, enhance the flow and quality of information, streamline the different processes, reduce costs, improve inventory management, shorten production cycle, on-time delivery and increase customer satisfaction.

Figure 2-3: Example of a Supply Chain Management System



Source: Laudon, Kenneth C and Laudon, Jane P, (2006). *Management Information Systems: Managing the Digital Firm*, (9th ed,), New Jersey, Prentice Education, Inc.(P 63)

2.1.2. Customer Relationship Management Systems:

Customer Relationship Management or CRM is probably the most important concept in modern business where customer satisfaction might be the most or sometimes the only way for organization to distinguish itself from other competitors and maintain its customers' loyalty. Kotler and Armstrong (2006) define CRM as "the over all process of building and maintaining profitable customer relationships by delivering superior customer value and satisfaction". Customer value refers to the value perceived by customer against the paid cost while customer satisfaction refers to the extend to which the product performance and the offered service match customers' expectations.

The increasing concern in customer relation management and tools that help in enhancing customers' satisfaction urged the development of Customer Relationship Management Systems. Customer Relationship Management Systems are sophisticated systems that employ data warehouse and substantial data mining techniques to gather all customer-related data from the different locations analyze

them and utilize the results to strengthen the existed relation and unfold the hidden opportunities. Fill (2006) stated that "CRM applications typically consist of call management, lead management, customer record, sales support and payment systems.

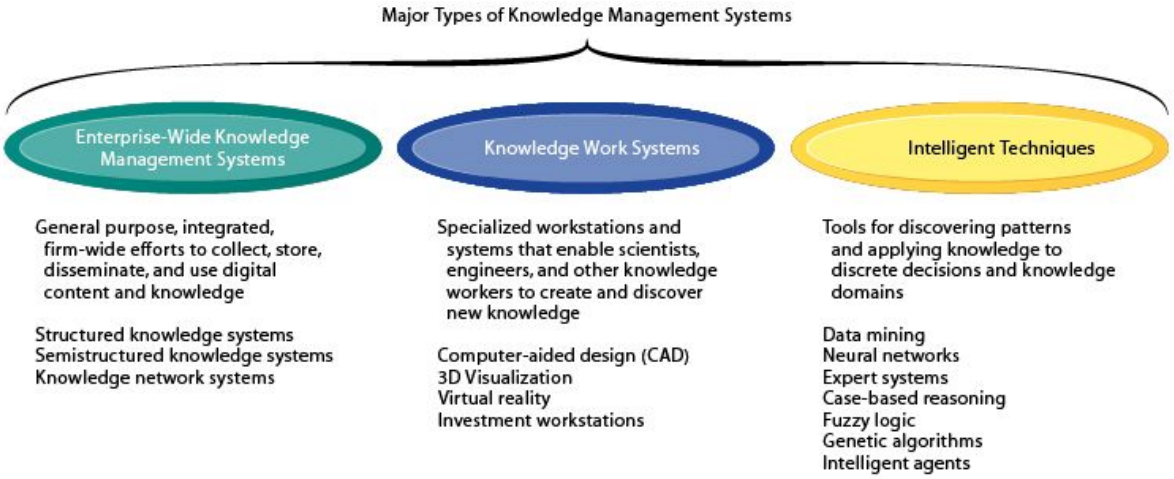
Customer Relationship Management Systems interacts with customer's life cycle to provide a clear vision about its performance, attitude and preferences so the organization can serve him accordingly. CRM can also help organization to recognize its most profitable relations and segments that have to be targeted. Kotler and Armstrong (2006) stated that "by using CRM to understand customers better, companies can provides higher levels of customer service and develop deeper customer relationships. They can use CRM to pinpoint high-value customers, target them more effectively, cross-sell the company's products and create offers tailored to specific customer requirements."

2.1.3. Knowledge Management Systems:

Knowledge is one of most important assets that organizations are paying more attention to sustain and manage lately. Basically, Knowledge management is about transforming data and/or information into actionable knowledge in a format that when it is made available can be utilized effectively and efficiently throughout an organization (Angus el. al., 1998). Davenport et. al. (1998) defined four main objectives of knowledge management: create knowledge repositories, improve knowledge access, enhance the knowledge environment and manage knowledge as an asset.

Laudon & Laudon (2006) defined three major types of knowledge management systems; Enterprise-Wide Knowledge Management Systems, Knowledge Work Systems and Intelligent Techniques (Figure 2-4)

Figure (2-4) Major Types of Knowledge Management Systems



Source: Laudon, Kenneth C and Laudon, Jane P, (2006). *Management Information Systems: Managing the Digital Firm*, (9th ed,), New Jersey, Prentice Education, Inc.(P 437)

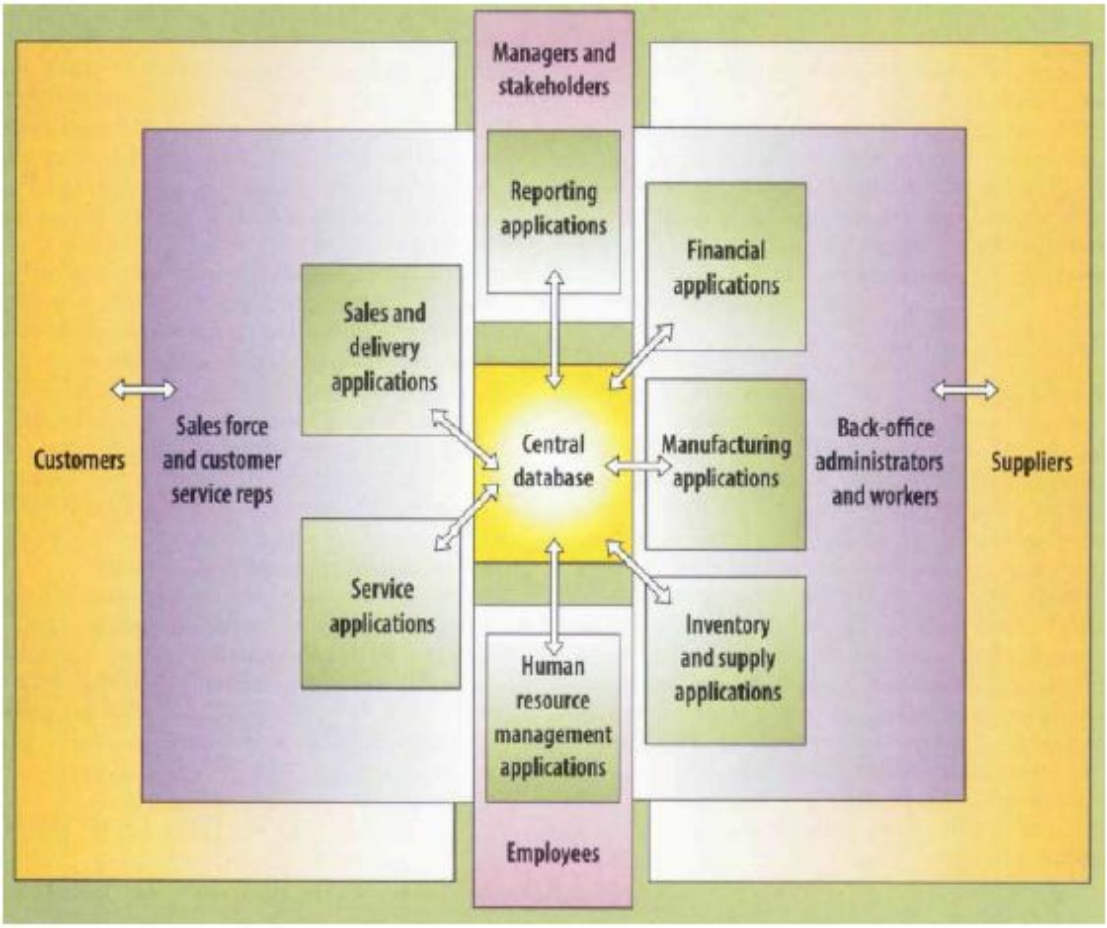
Enterprise-Wide Knowledge Management Systems tend to collect structured and unstructured knowledge, store and disseminate them. Knowledge Work Systems help workers to gain new knowledge. Intelligent Techniques used to collect knowledge and enhance knowledge base.

2.1.4. Enterprise Systems:

Despite the benefits reaped by the above discussed systems, these systems are still too specialized and limited in a single functional area within the organization. Because of that, organization ended up using many systems each serves a certain function. These systems are usually poorly integrated and connected with other the thing that typically leads to redundant, inaccurate and slow flow of data among users. IT responded by developing and introducing ERP systems in 1990's as solutions for traditional problems faced with legacy systems and improve the overall performance of organizations.

Wallace and Kremzar (2001) described ERP as an enterprise-wide set of management tools that balances demand and supply, containing the ability to link customers and suppliers into a complete supply chain, employing proven business processes for decision-making and proving high degrees of cross-functional integration among sales, marketing, manufacturing, operations, logistics, purchasing, finance, new product development and human resources, thereby enabling people to run their business with high levels of customer service and productivity and simultaneously lower costs and inventories, and providing the foundation for effective e-commerce. Figure (2-5) illustrates the anatomy of ERP systems where all major functions are linked by a central database that enables to exchange a high data quality on a real-time among all users.

Figure (2-5): Anatomy of an Enterprise System



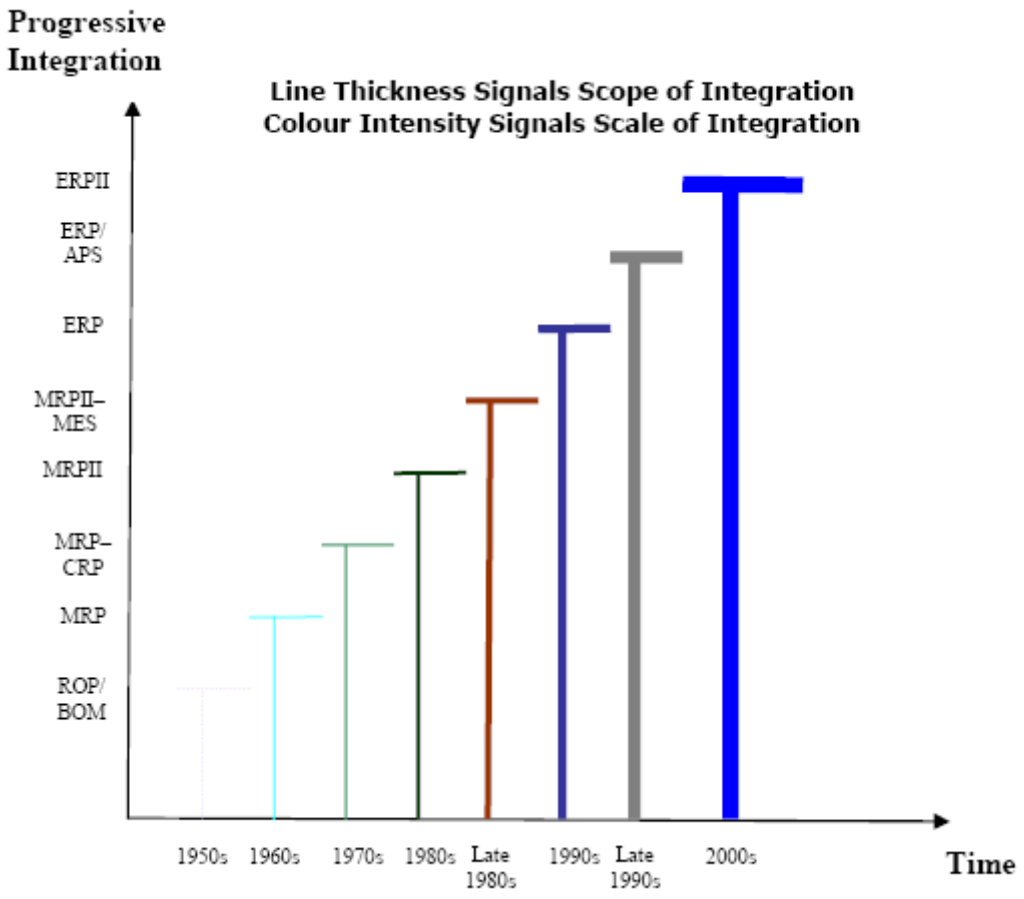
Source: Davenport, T., (1998). *Putting the Enterprise into the Enterprise System*. Harvard Business Review

2.2. ERP Evolution:

Enterprise Resource Planning (ERP) systems are basically the last generation of a series of information systems that firstly introduced in 1950's mainly to manage materials and manufacturing related processes. Bedworth and Bailey (1987) stated that ERP systems have evolved from Materials Requirement Planning (MRP) and Manufacturing Resource Planning (MRPII) systems.

These systems, subject to further extensions and evolutions, have leaded to the lunching of ERP systems which perceive as a revolution in information management system's world nowadays. Thus, the understanding of ERP history is prerequisite for comprehending its current application and future direction (Deloitte Consulting 1999; Ptak & Schragenhiem 2004). Figure (2-6) illustrates the timeline of ERP systems' evolution starting by Reorder Point and Bill Of Material in 1950's to fully-integrated ERPII systems.

Figure 2- 6: ERP Software Evolution Timeline



Source: Wickramasinghe, J., (2007). *The value relevance of Enterprise Resource Planning information*, (unpublished doctoral dissertation), Bond University, Australia

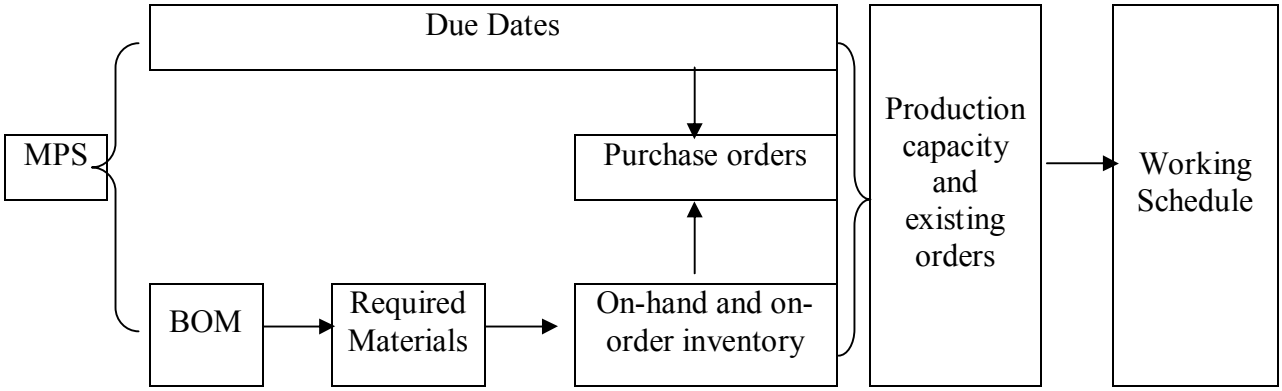
The evolution of ERP began with the Reorder Point (ROP) software that has been introduced in 1950's to enhance inventory management by tracking the stock levels. Despite the success initially witnessed in terms of stock controlling and inventory cost reduction, ROP systems performance have rapidly declined for failing to cope with the change of demand because of their reliance on historical instead of forecasted data. IT responded with presenting the Material Requirements Planning (MRP) systems in 1960's to get over ROP systems deficiencies.

Material Requirement Planning (MRP) allow organization to effectively place and adjust their production plans as well as materials replenishment orders according to the change on demand and forecast using the Master Production Schedule (MPS). APIS, the professional society that has promoted the adaptation of MRP and ERP systems and provided user education, describes MRP as "A set of techniques that uses bill of material, inventory data and the master production schedule to calculate requirements of materials. It makes recommendations to release replenishment orders for material. Further, because it is time-phased, it makes recommendations to reschedule open orders when due dates and needed dates are in phase. Time-phased MRP begins with the items listed on the

MPS and determines (1) the quantity of all components and materials required to fabricate those items and (2) the date that the components and material are required. Time-Phased MRP is accomplished by exploding the bill of material, adjusting of inventory quantities on hand or on order, and offsetting the nest requirements by appropriate lead time" (Cox & Blackstone, 1998).

The major advantage for MPS systems therefore was their flexibility in an efficient meeting for the exact demands through the periodic update of the Master Production Schedule (MPS) in consistence with production time & capacity, existing orders, inventory level and materials ordering in correspondence for the Bill of Materials. Figure (2-7) that has been set by the researcher illustrates the MRP cycle that begins with Master Production Schedule (MPS) that determines what, when and how much products are to be manufactured in a certain production period based on a group of variables; mainly forecast demand, lead time and production capacity. Bill of Material calculates quantities of materials, components and subassemblies required to produce these products accordingly. Taking in consideration the inventory (on-hand and on-order) and existing orders, MRP then triggers purchasing orders for the required materials within the due time and set most convenience production plan.

Figure 2-7: Material Requirement Planning system's cycle



MRP systems have significantly increase the flexibility of production schedules, improve stock level and material ordering processes, reduce the inventory cost, shorten the production cycle, in-time orders delivery and more customer satisfaction.

Despite the huge leap made in information system by the development of Material Requirement planning systems and their effectiveness organizations' capability to better and more efficient production/material management, their plans have shown limited flexibility in coping with processes' volatility for being placed based on stable shop-floor conditions with minimal disturbance to work flow. Therefore, MRP systems have then enhanced with Capacity Requirements Planning (CRP) and Shop Floor Controls (SFC) to apply a better control on shop-floor and any disturbance in the flow of work. Together, MRP and CRP consist an upgrade version of MRP systems named "Closed Loop MRP".

After making substantial achievements in production planning and materials management, the need to upgrade MRP capabilities to support more strategic plans like resources planning has emerged. In 1980's, MRP have been taking to the next level by "incorporating the financial accounting system along with manufacturing and materials management systems (Somers and Nelson, 2003) to consist Manufacturing Resource Planning or MRPII systems. Palaniswamy & Frank (2000) stated that MRPII includes more business functionality than MRP, dealing with sales, production, inventory, schedules and cash flow. MRPII have therefore widened the benefits that can be reaped by these systems. Duchessi, Schaninger & Hobbs (1989) on one hand stated that firms reported major improvements in plan efficiency, production scheduling, production morale, coordination with marketing and finance, customer service and competitive position whilst concurrently reducing inventory levels, component shortage, safety stocks, lead times and manufacturing costs. Ptak & Schragenheim (2004) on the other hand stated that MRPII system grant better planning and utilization of manufacturing capacity, rich analytical insights into the impact of manufacturing on enterprise financial performance and correctives for expectations from operational and financial plans.

With the accelerating competition, time becomes a critical element where quick response for customers demand is necessity for organizations to maintain their position in the market. However, quick responses mean continuous changing in both, rhythm and consequence of the planned processes magnifying by that the volatility in work flow. Manufacturing Execution Systems or MES have been emerge by integrating MRPII with the Shop Floor routing Control (SFC) to control the manufacturing operations when executed. This integration served to deliver flexible real-time manufacturing planning, feedback and control through the real time exchange of manufacturing execution planning information between the MES and upstream MRPII systems on one hand, and control and feedback information between the MES and downstream SFC systems on the other (Marks 1997).

In order to further enhance information consistency, more extensions have been made on these systems to finally cover all business process within organizations. This new generation of systems that grant an enterprise-wide integration were first shown on 1990's and named Enterprise Resource Planning or ERP systems. Somers and Nelson (2003) stated that "ERP systems provide seamless integration of all information flows in the company - financial accounting, human resources, supply chain management and customer information."

Later on and in order to apply a better control on Supply Chain, ERP systems have further enhanced by being integrated with systems that concern with Supply Chain Management like Advance Planning and Scheduling (APS) system, Warehouse Management System (WMS) and Transport Management System (TMS) leading to an upgrade ERP version called ERPII. Furthermore, ERP and ERPII systems are still a subject of further enhancements by being integrated with more systems like Customer Relationship Management (CRM) systems, Product Lifecycle Management (PLM) systems, Corporate Performance Management (CPM) systems and so forth.

2.3. ERP DEFINITION:

Enterprise Resource Planning (ERP) system is a set of modules each works on a particular functional area yet linked together to one main accessible database by all users if authorized. According to Jacobs & Whybark (2000) "the easiest way to think of ERP is as a big information system that everybody has access to."

This unique design grants a high integration among different functional areas within the organization, streamline their business process; reduce redundancy as well as improving the quality, accuracy and sharing of data. Laudon and Laudon (2006) define ERP as "a suite of integrated software modules and a common central database. The database collects data from many different divisions and departments in a firm and from a large number of key business processes in manufacturing and production, finance and accounting, sales and marketing and human resources, making the data available for applications that support nearly all of an organization's internal business activities. When new information is entered by one process, the information is made immediately available to other business processes". According to Deloitte Consulting, an ERP System is a packaged business software system that allows a company to "automate and integrate the majority of its business processes, share common data and practices across the enterprise, and produce and access information in real-time environment. (Sumner, 2005 page 2)

Basically, the improvements in processes brought by an ERP system are evolved from its information-integration role. Ribbers and Schoo (2002) state that an ERP system is a tool that provides the company with consistent, reliable, timely and accurate data about internal operation and processes. These integrated enterprise-computing systems provide seamless integration of all the information flowing though an organization. (Markus and Tanis, 2000)

Generally, main characteristics of ERP system have been summarized in Rashid et. al. (2002) as below:

- The system comprises many business modules linked together on single data base such as: financial, manufacturing, accounting, inventory management etc.
- The system should use centralized common database
- The integration between the system modules should provide seamless dataflow, increasing operational transparency through standard interfaces.
- The system modules work in real-time with one-line and batch processing capabilities.
- ERP system flexible and offer best business practices.
- New trend in ERP system to be internet-enabled systems.

Nowadays, ERP is an outstanding system in business information management world that overstep other systems in more than level. For example, Davenport (2000) identifies five technical factors that distinguish ERP systems from processors systems:

1- **Modular Construction**: ERP systems designed as a set of modules. Each module serves one functional area.
2- **Client/server architecture:** in ERP systems, a server does some processing while personal computers do the rest.

3- **Configuration:** ERP systems are designed upon best practice processes that help organizations streamline their operations. Organizations however may need to reengineer their processes if not matching ERP systems.
4- **Common Central Database:** many other systems share this feature with ERP. However, it has reached the highest level of successful execution in ERP.
5- **Variable Interfaces:** as global systems, ERP systems include interfaces that match the different countries in which firms operate.

2.4. ERP Adaptation Motivations:

Motivations behind adopting ERP systems vary from an organization to another according to their visions, requirements, capabilities, size, sector and difficulties they need to eliminate. In general, organizations often adopt last software generation as a response for modern business requirements and to take advantage of last technology hence gaining a competitive advantage over other competitors.

In ERP case, the major motivation is the need to integrate all functional processes together in a single system. Before, organization's processes were segmented in more than one system that are poorly integrated with each other leading to duplication and inaccuracy of data. Hence, Organizations tempt to improve the quality and flow of its data, eliminate duplication and enhance the coordination among their different units by implementing an ERP system.

Global demands imposed by cross-countries businesses and transactions existed in almost all organizations world-wide is also a major motivation for ERP adaptation. ERP systems unify business language among organizations, enhance communication and grant a high level of flexibility in terms of currencies, languages and so forth.

Another important motivation is increasing trend toward web-based strategies and e-commerce that require suitable IT infrastructures. Davenport (2000) stated that good web access to important information needed by customers, suppliers and employees for decision-making necessitates robust systems with good web connections to them. Organizations therefore adopt ERP system to support their web-based strategies and activities.

More detailed motivations have been addressed by a number of studies. Markus and Tanis (2000) for example reported a number of motivations and classified them into two major categories; technical and Business motivations.

- Technical Motivations include:
    - Reducing systems operating costs
    - Solving specific problems such as Y2K
    - Accommodating increased system capacity
    - Solving maintenance problems with legacy systems.

- Business Motivations include:
    - The ability to present a single face to the customer
    - The ability to quote realistic delivery dates based on current inventory and shop capacity
    - Accommodation of business growth

- Improvement of informal and inefficient business processes
- Standardize data
- Reduction of inventory carrying costs
- Elimination of delays and errors in filling customer orders

Parr and Shanks (2000), summarized ERP adaptation motivations have been summarized in three categories; Strategic motivations, operational motivations and tactical motivations.

- Strategic Motivations:
    - Business Restructuring
    - Customer Responsiveness
    - Decision-making improvement
    - Multi-site standardization
    - Need for efficiencies an integration
    - Y2K compliance

- Operational Motivations:
    - Data visibility
    - Operating cost reductions
    - Process improvement

- Technical Motivations:
    - Common platform/obsolescence of legacy systems

However, some motivations seem to be more important than others. Olhager and Selldin (2003) and Marbert et al. (2000) listed the major motivations based on survey they done on Swedish and U.S. companies that adopted ERP systems:

Table 2-1: Company's Motivations to Implement ERP

Company's Motivations to Implement ERP	Swedish Average	U.S. Average
Replace legacy systems	4.11	4.00
Simplify and standardize systems	3.67	3.85
Gain strategic advantage	3.18	3.64
Improve interactions with suppliers, customers	3.16	3.55
Ease of upgrading systems	2.96	2.91
Link to global activities	2.85	3.17
Restructure company organization	2.70	2.58
Solve the Y2K problem	2.48	3.08
Pressure to keep up with competitors	2.48	2.9

Scale: 1(not important) to 5 (very important)

Sumner, Mary (2005). *Enterprise Resource Planning,* (1st ed), New Jersey,: Prentice-Hall, Inc. (P 7)

2.5. ERP Life Cycle

ERP is a sophisticated system that involves technical, social and organizational aspects the reason why planning consists a very important factor for a successful implementation. Wognum et. al (2004) stated that implementing the ERP system is not an easy job, this is due to the fact that so many aspects must be managed and controlled on the same time.

A good knowledge and deep understanding of ERP project life cycle and the activities that should be done on each phase would greatly improve the project planning and the way the implementation process will be handled.

For that sake, many models have been proposed to illustrate ERP life cycle. Rajagopal (2002) represented a six-stage model for ERP implementation:

- Initial Stage: this stage includes the definition of needs, motivation and objectives expected from implementing an ERP system.
- Adoption Stage: this stage includes adaptation decision, cost benefits analysis, choosing the appropriate technology and choosing the system's vendor.

- Adaptation Stage; this stage includes choosing the suitable package, the implementation approach, minimizing the user resistance and running the system in the individual units.
- Acceptance Stage: this phase tends to enhance the usage of the system, modifying and customizing the system, conduct system training and achieving the functional integration.
- Routinization Stage: in which user acceptance is achieved, complete the bug fixing and insuring the full system integration.
- Infusion Stage: the last stage according to this model includes the integration on global level and planning for the next innovation step.

Another model by Markus and Tanis (2000) divided ERP systems implementation into four phases:

- **The charting Phase:**
    - Building the business justification for the project
    - Selecting the software to be used
    - Identifying the project manager
    - Approval of budget and schedule
- **The Project Phase:**
    - Software configuration
    - Systems integration
    - Testing
    - Data conversion
    - Training
    - Rollout
- **The Shakedown Phase:**
    - Bug fixing and rework
    - System performance and tuning
    - Retraining
    - Staffing up to handle temporary inefficiencies

- **The Onward and Upward Phase:**
    - Continuous business improvement
    - Additional user skill building
    - Post implementation benefit assessment

Parr and Shanks (2002) also stated three phases for implementing ERP system:

- **Planning Phase:** includes selection of , allocating resources, project manager and implementation team
- **ERP Project Phase:** refers to installation of software
- **Enhancement Phase**: includes system repair, extension and upgrading. This may last for years.

In general, ERP implementation goes through certain phases that can be summarized in six phases which are:

2.5.1. Planning:

This phase is where ERP project idea blooms and a clear vision about the system impact on organization's future-processes generated. A well designed plan is essential to enlighten the main aspects of project and justify the huge resources are to be allocated for the implementation. It identifies the duration, cost, budget, risks and benefits.

A simple tool to study the feasibility of an ERP project is a Cost-Benefit Analysis that takes in consideration the net present value of money. This analysis studies the benefits of ERP (tangible and intangible) against costs (one-time and on-going).

The table below illustrates an example for Cost-benefit Analysis by Sumner for a $2,420,000 ERP system. The figures used in the example were in line with research on ERP implementation costs conducted in the US and Sweden by Olhager and Selldin (2003) and Marbert et al., (2000). (Sumner, 2005)

Table 2-2: Net Present Value of an ERP Project

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Software	2,420,000					
Software Licenses		220,000	220,000	220,000	220,000	220,000
Hardware	1,850,000					
Consulting	3,000,400					
Training	1,280,000					
Implementation Team	400,000	400,000	400,000	400,000		
Total Costs	8,950,400	620,000	620,000	620,000	220,000	220,000
Savings	0					
Reduced Inventory Costs		2,750,000	2,750,000	2,750,000	2,750,000	2,750,000
Reduced Administrative Costs		1,250,000	1,250,000	1,250,000	1,250,000	1,250,000
Intangible Benefits						
Total Saving		4,000,000	4,000,000	4,000,000	4,000,000	4,000,000
Net Balance	-8,950,400	3,380,000	3,380,000	3,380,000	3,780,000	3,780,000
DCF Factor	1.00	0.909	0.826	0.751	0.683	0.621
Discounted Balance	-8,950,400	3072420	2791880	253380	2581740	2347380
Cumulative Discounted Balance	-8,950,400	-5877980	-3,086,100	-547,720	2,034,020	4,381,400

Source: Sumner, Mary (2005). *Enterprise Resource Planning,* (1st ed), New Jersey,: Prentice-Hall, Inc. (P 12)

"The proposed ERP project will have a positive discount balance in year 1, and the company will break even on its software investment in ERP in year 4, when the accumulative discount balance is $2,034, 020. Based upon this analysis, the investment in an ERP system is a wise investment" (Sumner, 2005)

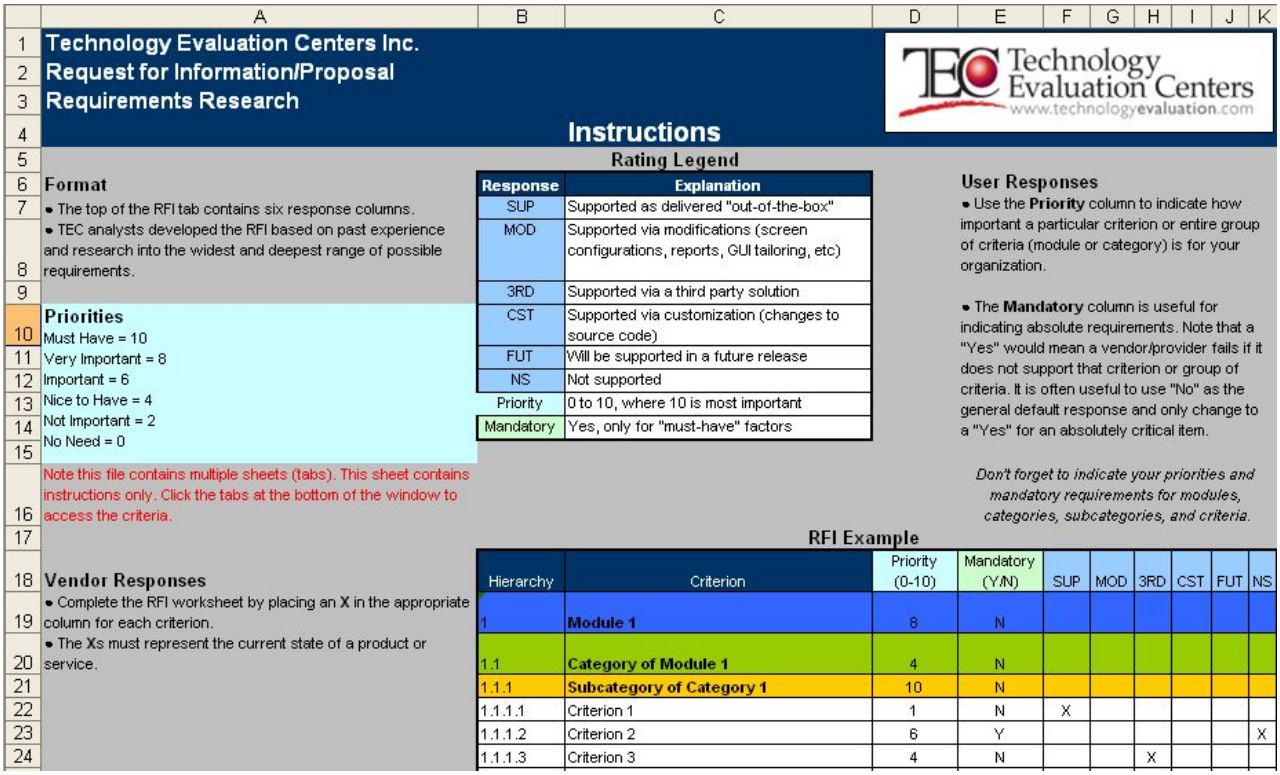
2.5.2. System Selection:

From this point on, all resources, efforts and plans are to be geared in a certain direction, and it should be the right direction. In this phase, organization's requirements, resources, capabilities and objectives of the organization have to be combined all together to select the most suitable ERP system.

As a start, it's recommended to conducts a GAP analysis. In GAP analysis, an organization can analyze its current situation and processes against the desired ones and defines gaps between them. These gaps along with objectives and budget determined by top management in previous phase should be translated into criteria for selecting the system.

Some templates have been developed for that sake that makes it easier for an organization to list its criteria and analyzing them more effectively

Figure 2-8: ERP system selection template



Technology Evaluation Centers Inc.
Request for Information/Proposal
Requirements Research

Technology Evaluation Centers
www.technologyevaluation.com

Instructions

Format
- The top of the RFI tab contains six response columns.
- TEC analysts developed the RFI based on past experience and research into the widest and deepest range of possible requirements.

Priorities
Must Have = 10
Very Important = 8
Important = 6
Nice to Have = 4
Not Important = 2
No Need = 0

Note this file contains multiple sheets (tabs). This sheet contains instructions only. Click the tabs at the bottom of the window to access the criteria.

Vendor Responses
- Complete the RFI worksheet by placing an X in the appropriate column for each criterion.
- The Xs must represent the current state of a product or service.

Rating Legend

Response	Explanation
SUP	Supported as delivered "out-of-the-box"
MOD	Supported via modifications (screen configurations, reports, GUI tailoring, etc)
3RD	Supported via a third party solution
CST	Supported via customization (changes to source code)
FUT	Will be supported in a future release
NS	Not supported
Priority	0 to 10, where 10 is most important
Mandatory	Yes, only for "must-have" factors

User Responses
- Use the **Priority** column to indicate how important a particular criterion or entire group of criteria (module or category) is for your organization.
- The **Mandatory** column is useful for indicating absolute requirements. Note that a "Yes" would mean a vendor/provider fails if it does not support that criterion or group of criteria. It is often useful to use "No" as the general default response and only change to a "Yes" for an absolutely critical item.

Don't forget to indicate your priorities and mandatory requirements for modules, categories, subcategories, and criteria.

RFI Example

Hierarchy	Criterion	Priority (0-10)	Mandatory (Y/N)	SUP	MOD	3RD	CST	FUT	NS
1	**Module 1**	8	N						
1.1	**Category of Module 1**	4	N						
1.1.1	**Subcategory of Category 1**	10	N						
1.1.1.1	Criterion 1	1	N	X					
1.1.1.2	Criterion 2	6	Y						X
1.1.1.3	Criterion 3	4	N			X			

Source: Technology Evaluation Centers, ***"Popular Request for Proposal (RFP) Templates"***, (on-line), available: http://rfp.technologyevaluation.com/samples/ETO-ERP_Selection_RFP_Template.xls

By that, options can be narrowed to few systems. Organization can select one among these alternatives in light of some preferences like system complexity, customer-friendly, total cost, degree of integration, security, estimated customization, close to legacy system and culture...etc

2.5.3. Pre-Implementation:

This phase includes all preparations organization make prior getting in the implementation process. These preparations include the modules to be implemented, choosing the implementation team, the implementation strategy and training.

Originally, the core of ERP system states in the unique integration between its modules. Organization supposed to implement all modules if it wants to get advantage of the whole benefits. This method calls "Vanilla Implementation" and it's too expensive to adopt. However, organization can select certain modules instead according to its budget and requirement. This way, the cost will considerable decreased.

Implementation team has to be carefully selected and intensively trained before implementing the system to make sure that the team is qualified to hold the implementation process professionally and efficiently. Preferably, employees get educated and trained on the system on this phase so they will show less resistance during the implementation.

Another important decision the top management should make in this phase is whether organization should reengineer its processes to fit ERP modules or customizing it to meet its unique requirements. This decision is very critical in ERP project and organization should be completely aware in the advantages and disadvantages of each option then taking the one that can fit its situation the most. Sumner (2005) declared the advantages and disadvantages of reengineering and customization approaches (table 2-3)

Table 2-3: Re-engineering vs. Customization

	Pros.	Cons.
Customization Approach	Support unique business processes, strategic processes are maintained	An ERP may not support these unique business processes, re-inventing the wheel, customization is difficult since modules are integrated, difficult to upgrade the software to newer version since upgrades are based on vanilla versions
Re-engineering Approach	Is supported by an ERP solution, takes advantage of shared or generic processes within industries (e.g., industry templates), best practices may represent improved process changes, documents best practices, works well when there is minimal organizational change.	Does not support strategic or unique business processes, resistance occurs when there is extensive organizational change.

Source: Sumner, Mary (2005). *Enterprise Resource Planning,* (1st ed,), New Jersey: Prentice-Hall, Inc. (P 45)

In summary; by the end of this phase, ERP project team (management and implementetors) has to be selected, implementation methodology and strategies have been set, team is well trained and employees have been properly educated about the system.

2.5.4. Implementation:

There are three main approaches to implement ERP systems: “Big Bang” approach, Local-wise approach and Module-wise approach. (Parthasarathy, 2007). In “Big Bang” approach, organization implements all modules at the same time so it can reap all benefits of system. However, this option is costly, risky and time consuming. Instead, organization can segment the implementation processes either on a location-wise by implementing it in a certain branch or regional office or module-wise by implementing selected module. The last two options considerably reduce costs, risks and duration. If smoothly gone, organization then can then extend the implementation processes to include the rest regions and modules.

This phase includes installing and configuring the system, migrating data from old to new system, assure integration among modules, establishing security and access authorities, running pilot test and testing and verifying outputs. Sumner (2005) stated that “ERP implementation includes addressing configuration issues, migrating data from the old system to the new system, building interfaces, implementing reports and pilot testing”.

Re-engineering of business processes done in this phase as well as any required customizations. End-users should be trained on the system in this phase if not trained on the preparations phase.

2.5.5. Post-Implementation:

Post implementation phase includes activities that support the ongoing and improvement of ERP system such as: continuous follow up and evaluation for the system, maintenance, troubleshooting, training of new users, upgrading, and training on the new versions.

2.5.6. Decline:

Although ERP systems have been designed to last, an organization may give up the system in some cases like high maintenance and/or upgrading cost, unavailable upgraded-version from vendor, availability of more advanced systems or versions from other vendors, failure of system to satisfy organization's need and so forth.

2.6. Benefits of ERP:

ERP is a multi-dimensional system that impacts the performance of the organization in more then level and side. A number of studies underlined the major improvements witnessed by those who implement an ERP system in general while others focused on a specific area mainly financial. However, there is a consensus among these studies that these benefits are gradually realized over time (Davenport, 2000; Nicolaou, 2004; Shang and Seddon, 2001).

Despite the wide number of improvements that have been labeled as ERP system benefits, researches find that these benefits take sometime that can extend to years before start appearing. On the contrary, organizations would likely witness a depression on their performance in the six to twelve months after the system goes alive (Cookie et al.,2001; Deloitte Consulting, 1998; Markus and Tanis, 2000; Ross,1999).

One of the main studies in this regard is the survey conducted by Benchmarking Partners Inc. for Deloitte Consulting in 1998, major ERP benefits have been divided into tangible and intangible:

- Tangible Benefits:
    - Inventory reduction
    - Personnel reduction.
    - Productivity improvement.
    - Order management improvement.
    - Financial close cycle reduction.
    - IT cost reduction.
    - Procurement cost reduction.
    - Cash management improvement.
    - Revenue/profit increase.
    - Transportation/logistics cost reduction.
    - Maintenance reduction.
    - On-line delivery improvement.
- Intangible Benefits:
    - Information visibility.
    - New/improved processes.
    - Customer responsiveness.
    - Integration.

- Standardization.
- Flexibility.
- Globalization.
- Y2K.
- Business performance.
- Supply/demand chain.

Another important study by Shang and Seddon (2002) divides ERP system benefits into five categories:

- Operational Benefits:
  - Cost reduction
  - Cycle time reduction
  - Productivity improvement
  - Quality improvement
  - Customer service improvement
- Managerial Benefits:
  - Better resource management
  - Improved decision making and planning
  - Performance improvement
- Strategic Benefits:
  - Support for business growth
  - Support for business alliance
  - Building business innovations
  - Building cost leadership
  - Generating product differentiation
  - Building external linkages
  - Enabling e-commerce
  - Generating or sustaining competitiveness

- IT Infrastructure:
    - Building business flexibility for current and future changes
    - IT cost reduction.
    - Increase IT infrastructure capability
- Organizational Benefits:
    - Changing work patterns.
    - Facilitating organizational learning
    - Empowerment.
    - Building common vision.
    - Shifting work focus.
    - Increased employee morale and satisfaction.

Another way to categorize the benefits of ERP systems is based on the use of technology (in an automating role) by automating processes of the organization to improve them or the use of data held in ERP systems (information role) by using ERP data by managers for a better decision making (Lorenzo, 2001). Swartz & Orgill, (2001) have also mentioned some of the most common benefits of an ERP system include (1) improved access and timely information, (2) enhanced workflow, (3) tighter control, (4) web-based interfaces and (5) streamlined processes.

Other researches studied ERP benefits from a financial standpoint. Nicolaou et al, (2004) recorded a significant increase I ROA and return on sales and lower cost of goods sold ratios after two to four years from system implementation. Hitt et al, (2002) also found that ERP systems adopters have better performance in terms of sales per employee, profit margins, return on assets, inventory turnover, asset utilization and account receivable turnover.

In general and after reviewing previous literatures, ERP benefits can be summarized as follow:

2.6.1. Financial Benefits:

Eventually, ERP benefits will be translated, either directly or indirectly, to numbers in organization's financial statements. Laughlin (1999) stated that ERP systems provide soft-dollar benefits including increased sales and revenues, improved margins and improved productivity.

In his article "Justification of ERP Investments" in TEC site on 2004, Dr. Scott Hamilton have illustrated the financial impact of ERP systems in the below Balance Sheet (Table 2-4) and Income Statement (Table 2-5) for a $10 million annual revenue manufacturing company. The used figures are the common improvements from a successful ERP system.

Table 2-4: Summarized Balance Sheet for a Typical $10 million Firm

	Current	Improvements	Benefits
Current Assets			
Cash and Other	500,000		
Account Receivable	2,000,000	18%	356,200
Inventory	3,000,000	20%	600,000
Fixed Assets	3,000,000		
Total Assets	$ 8,500,000		$ 956,200
Current Liabilities	xxx,xxx		
Non Current Liabilities	xxx,xxx		
Stockholder's Equity	xxx,xxx		
Total Liability and Equity	xxx,xxx		

Source: Hamilton, S., (2004), "Justification of ERP Investments", (on-line), available: http://www.technologyevaluation.com/Research/ResearchHighlights/Erp/2004/02/research_notes/TU_ER_XSH_02_10_04_13.asp

"Based on prior research concerning industry averages for improvements, implementation of an ERP system can lead to a 20% inventory reduction and an 18% receivables reduction." (Hamilton, 2004). In the example, the ERP saved the organization $ 956,200.

In the income statement (table 2-5), a 25% reduction in carrying charges, 5% in material cost, 10% in labor cost beside a 10% increase is sales leaded to a $475,000 saving.

Table 2-5: Summarized Income Statement for a Typical $10 million Firm

	Current	Improvements	Benefits
Sales	$10,000,000	10%	
Cost of Materials	7,500,000		
Material	4,500,000	5%	$ 225,000
Labor	1,000,000	10%	$ 100,000
Overhead	2,000,000		
Administrative Expenses	2,000,000		$ 150,000
Pretax Income	500,000		$ 475,000

Source: Hamilton, S., (2004), "Justification of ERP Investments", (on-line), available: http://www.technologyevaluation.com/Research/ResearchHighlights/Erp/2004/02/research_notes/TU_ER_XSH_02_10_04_13.asp

Furthermore, studies like Hitt et al. (2002); Hunton et al. (2003) and Nicolaou (2004) have indicated great improvements on different financial ratios. ERP system adopters found to record a higher Inventory Turnover (cost of sales/inventory) and Return on Assets (profit before taxes/total assets) reflecting effective employment of resources, better inventory management and liquidity. ERP adopters have also recorded a lower Days of Receivables (365*1/(sales/receivables) ratio that expresses a better management for accounts receivable and cash flow accordingly.

Another financial benefit of ERP system is the impact on stock price. Although stock price is affected by many factors, its impact can be estimated. For this sake, Dr. Hamilton used the same example to illustrate the impact of ERP system improvements on stock price assuming 100,000 shares outstanding with a stock price $30/share and price/earnings multiplier of six. (table 2-6)

Table 2-6: The Impact of ERP on Stock Price

	Before ERP	After ERP
Before tax profit	$500,000.00	$980,000.00
Earnings per share	$5.00	$9.80
Current stock price	**$30.00**	6*9.80=**$58.80**
Multiplier	6	6

Source: Hamilton, S., (2004), "Justification of ERP Investments", (on-line), available: http://www.technologyevaluation.com/Research/ResearchHighlights/Erp/2004/02/research_notes/TU_ER_XSH_02_10_04_13.asp

The $475,000 saving in the income statement increased the organization's profit hence the earning per share. In the example, this savings have increased the share price from $30 to $58.8.

2.6.2. Operational Benefits:

Operational benefits refer to the improvements on an organization's processes and routine operations. These benefits are the direct and first benefits that arise from the ERP system. Davenport et al. (2002) stated that the operational benefits of an ERP system include improved transactional processes or streamlined business processes and these benefits arise earlier than 2managerial benefits such as improved decision making or better planning. Cooke and Peterson (1998) pointed that ERP systems may be an instrument to move a firm away from inefficient business processes and toward accepted best practice business process.

A main advantage of ERP system is integrating and standardizing that grant organizations considerable savings in time, cost and effort. Davenport (1998) stated that process standardization and integration across organizational units makes administrative activities centralized, like account payable and payroll. This may allow administrative savings. Major savings recorded in Deloitte Consulting survey (1998) were in inventory, labor, procurement, logistics and maintenance. Piturro, (1999) mentioned that ERP system can speed up business processes, reduce cycle time, and reduce the cost of business processes such as credit checking.

Further improvements were noticed in terms of responsiveness, orders' management, delivery time, cash management and flexibility by enabling the use different languages, currencies and accounting standards through one single system.

Another important benefit for ERP system is enabling the organization to utilize and maximize its benefits from the latest developments in information technology such as e-commerce, Internet, intranet and so forth. Moreover, ERP systems may reduce IS maintenance costs and increase the ability to deploy new IS functionality (Ross, 1998)

2.6.3. Managerial Benefits:

The centralization of Data and advanced analyzing capabilities offered by ERP systems ERP provide managers with real-time accurate information which greatly improve decision making. Better decisions on managerial level mean better resource utilization, sufficient investments, better planning and performance.

2.6.4. Knowledge Benefits:

In modern business, Knowledge is considered one of the most essential assets for organizations that can be a strong competitive advantage if well managed and properly utilized. ERP systems play a key role in gathering, storing and sharing knowledge and information across the organization.

According to Deloitte Consulting survey, 55% of the surveyed companies have witnessed an improvement information visibility which is the highest percentage among all other recorded benefits. This information visibility comes from the design of ERP system that integrates and centralizes information in one database which minimizes error and improves the flow of these data. Davenport (1998) mentioned that ERP is a set of activities designed to solve the fragmentation of information and processes in large business organization. Moreover, the online-interface provided by ERP between the different functional areas within an organization improve not only the quality and accuracy of information, but also the timing.

Another advantage for ERP systems are enhancing the knowledge sharing across the organization. Davenport (2000) stated that integrated system provides shared information across the organization and this information can be used to monitor business performance. Huang (1993) found that ERP systems can facilitate intra-organizational sharing of knowledge in two ways:

1- Increasing the opportunities to share knowledge. Processes reengineering and efficient work flow increase the coordination and communication within the organization hence the sharing of knowledge. Goodhue et al. (1992) point out that standardization and integration facilitate communications and better coordination.

2- Enhancing employees' motivations to share knowledge. "through empowerment, increasing employees' morale and satisfaction and building common vision, organizations can inspire employees' incentives to share their knowledge and then build the knowledge sharing culture within organizations" (Huang, 1993)

2.7. Cost of ERP:

A major disadvantage fort ERP system is their high cost which has been a big barrier for many companies to not adopting one. Beside the expensive software itself, ERP system implementation requires further costs for training courses, implementers and consultants' fees, suitable hardware as well as system's maintenance, license, upgrading and so forth. In surveys conducted in United States and Sweden, major ERP implementation costs recorded in table (2-7) (Olhager and Selledin, 2003; Marbert et al, 2000)

Table 2-7: ERP cost Components

ERP Cost Component	Swedish%	U.S.%
Software	24.2	30.2
Hardware	18.5	17.8
Consulting	30.1	24.1
Training	13.8	10.9
Implementation Team	12.0	13.6

Source: Sumner, Mary (2005). *Enterprise Resource Planning,* (1st ed), New Jersey: Prentice-Hall, Inc. (P 11)

"Enterprise Resource Planning (ERP) implementation costs can be divided into on-time costs and ongoing costs. Both types of costs can be segmented into hardware, software, external assistance and internal personnel" (Hamilton, 2004)

2.7.1. One-Time Cost:

2.7.1.1. **Software Cost:** refers to the cost of the system itself which vary from few tens of thousands to millions of dollars according to the size and vendor. Software cost also includes customization and integration of ERP with other applications.

2.7.1.2. **Hardware Cost:** the one-time hardware cost refer to the hardware required for the system's implementation or the upgrading cost for the existing hardware. For small systems, the local network and existing hardware may be sufficient.

2.7.1.3. **External Assistance Cost:** external assistance cost includes the training and consultation cost. These costs are extrusively related to the complexity and size of system.

Dr. Hamilton (2004) states that a general guideline for the ratio of these costs to the software cost vary from 0.5-1.0 for micro-based ERP packages to 3.0-5.0 for mainframe ERP packages.

2.7.1.4. **Internal Personnel:** ERP implementation requires commitment from managerial, project and organizational level. This commitment involves activities like training classes, re-engineering the existing processes, reporting and so forth.

2.7.2. Ongoing Annual Cost:

2.7.2.1. **Software Cost:** the ongoing Software Costs include mainly the upgrading cost, annual support and maintenance agreements with vendor. These costs ratio to the software cost is estimated to be 0.15-2.0.

2.7.2.2. **Hardware Cost:** upon upgrading the system in coming phases, special hardware might be needed.

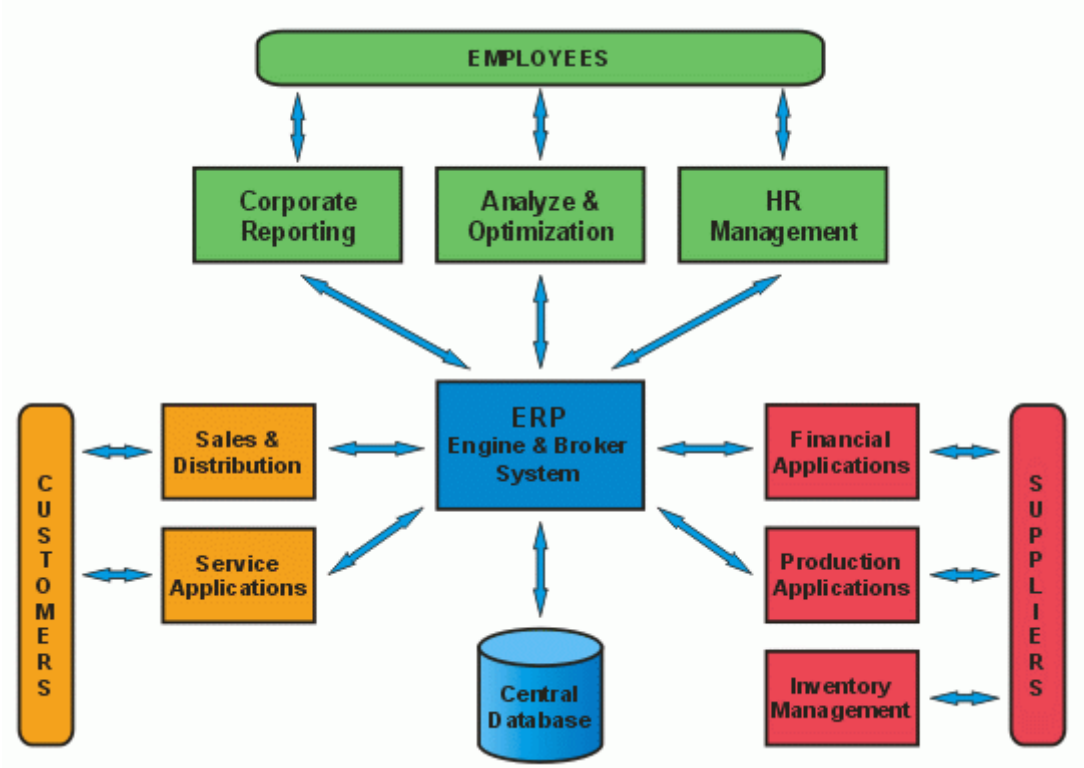
2.7.2.3. **External Assistance Cost:** ongoing external assistance costs refer ro the continuous training and consultation to improve business processes, maintain the system's performance and activate the poorly used functions. These costs' ratio to the system's cost is around 0.1-0.2.

2.7.2.5. **Internal Personnel:** internal team role continues even after the implementation of the system by following-up the system's utilization, support and training. These costs ratio to the system cost is around 0.1-0.2.

2.8. ERP Modules:

Enterprise Resource Planning is an integrated, software-centric information system (Klaus, Rosenmann & Gable, 2000) that operates via a common database at the core of the system (Burt, 2000). ERP system; therefore, links all enterprise's functions in a single database proving by that an interactive environment for all system's users across the organization to execute their jobs in a much more efficient, accurate and easy way. Figure (2-9) illustrates the central-database concept in ERP Systems.

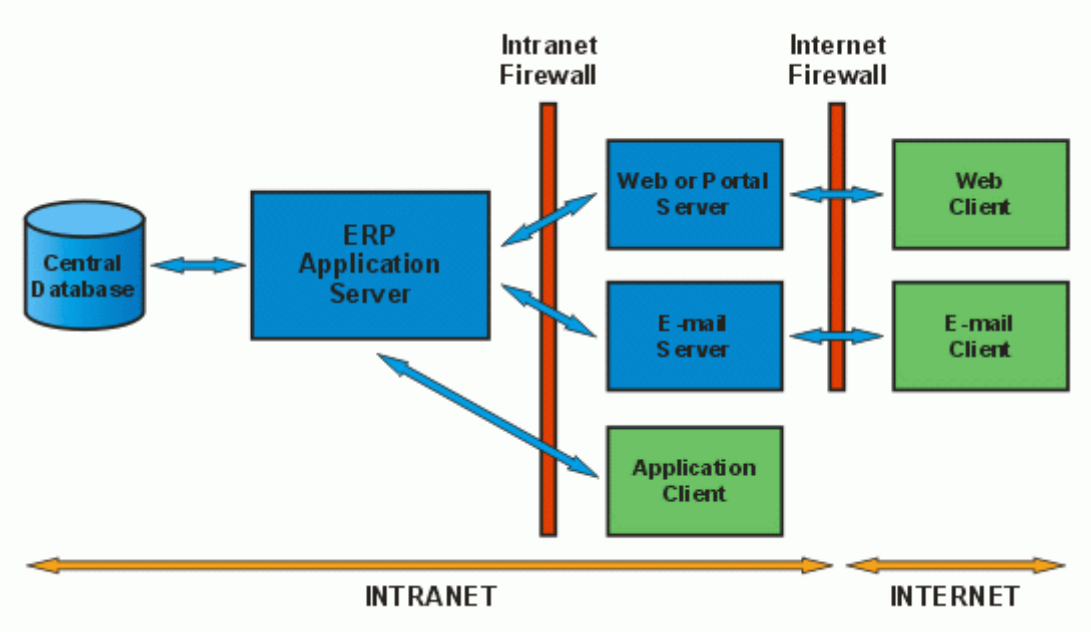
Figure 2-9: ERP Concept



Source: http://www.rts-systems.com/EN/ERP.html

A key characteristic that greatly support the integration concept is ERP systems are the web-based interface among linked processes. This characteristic enhance the sharing, exchanging and obtaining real-time information from one hand, and supporting e-commerce procedures by enabling online business transactions between the organization and its suppliers/customers such as order placement, order tracking, inventory status and so on. Figure (2-10) illustrates the web-based interface concept in ERP systems.

Figure 2-10: Web-Based ERP enabling



Source: http://www.rts-systems.com/EN/ERP.html

On an operational level, ERP systems come in a modular design each developed to serve a particular functional area yet attached to the central database to maintain the enterprise-wide integration concept in ERP systems. Number of modules varies from a system to another even from the same vendor, however, McCann (1999) stated that there are ERP applications available for to fit just about any need business may encounter. The nominating and the number of included modules are than a vendor's variable. An example on the nominating variation of modules among ERP vendors is shown in table (2-8)

Table 2-8: ERP Modules supported by Vendors

Function	SAP	Oracle	PeopleSoft
Sales Order Processing	Sales and Distribution	Marketing Sales Supply Chain	Supply Chain Management
Purchasing	Materials Management (MM)	Procurement	Supplier Relationship Management
Production Planning	Production Planning (PP)	Manufacturing	
Financial Accounting	Financial Accounting (FC)	Financials	Financial Management Systems
Management Accounting	Controlling (CO)		
Human Resources	Human Resources (HU)	Human Resources	Human Capital Management

Source: Sumner, Mary (2005). *Enterprise Resource Planning,* (1st ed), New Jersey: Prentice-Hall, Inc. (P 8)

As for the system chosen for this study, Baan LN, some the included modules are:

- **People:**

- **Master Data Management Module (MDM):** this module enables company to register all employees' related information and using them to generate hours and expenses.

- **Time Management Module (TMM):** used to record and budget hours worked by employees.

- **Financials**

- **General Ledger (GLD):** this module accounts for all financial transactions and also includes a multi-currency system, multi financial companies linkage and tax reporting.

- **Account Receivable (ACR**): that handles and monitors sales invoices, credit notes, credit checking, credit management and customer balance management.

- **Account Payable (ACP):** handles purchase invoices, credit notes and supplier balance management.
- **Cash Management (CMG**): this module manages all cash related transactions either in a manually or electrically through the e-banking capability provided by the system.
- **Financial Budged System (FBS):** this module allocates amounts and quantities needed for planning ledger and it's strongly connected with the Cash Management and Cost accounting modules.
- **Cost Accounting (CAT):** this module concern in cost analysis by registering and monitoring the actual allocated amount and quantities to calculate and control the real costs.
- **Fixed Assets Management (FAM**): this module manages all costs and transactions related to organization's fixed assets like depreciation, revaluation, transfer and so on.
- **Financial Statements (FST):** is a reporting module where financial reports and statements like balance sheets and profit/loss statement can be generated.

▪ Order Management

- **Pricing Module:** manages sales prices, purchasing prices, discounts and promotions.
- **Sales Control Module:** handles the whole sales ordering process from quotations control, contracts, schedules, orders, commissions and rebates.
- **Purchase Control Module:** handles the whole purchasing process including purchase requisitions, purchase request for quotation, purchase order entry and vendor management.
- **Relation Management Module:** uses to manage organization's suppliers and customers information.
- **Delivery Contract Module:** uses to manage a sales/purchasing contract with multiple orders that have different delivery date.
- **Purchase Schedule Contract:** defined purchase contract can be used in Purchases Schedule.
- **Purchase Contract Line Logistic Data:** after being used in purchase schedule, related logistics and shipping data should follow.

▪ Central Invoicing

This package contains only the Sales Invoicing (SLI) Module that is specifically concerns in creating and managing invoices based on other modules data such us financial and logistics modules.

▪ Manufacturing

- **Engineering Data Management (EDM) Module**: follows up and update product's specifications though its life cycle using many functions like product structure engineering, revision control, mass BOM changes and approval procedures
- **Item Production Data (IPD) Module**: responsible for all manufacturing related item data such as BOM data, Routing data, Backflush data, Repetitive data and Order parameters.
- **Bill of Material (BOM)**: used to define product structure and sub-components.
- **Routing Module**: defines the method of manufacturing and all its production steps.
- **Configuration (PCF)**: this module enables customers to make some customizations in their products. This module defines these customizations and translates them into adjusted BOM, routing and descriptions.
- **Shop Floor Control (SFC) Module**: control the influence of production process.
- **Repetitive Manufacturing (RPT) module**: facilitate the production control of repetitively ordered products.
- **Tool Requirement Planning (TRP) Module:** concerns in defining, purchasing, maintaining and life cycle of tools required for production.

▪ Warehouse Management

- **Warehouse Master Data:** include data about warehouses, stored items and warehouse procedures.
- **Inventory Planning Module:** includes all transactions related to the inventory such as production orders, purchase orders, sales orders and service orders. This module includes also inventory commitment function that deal with inventory reservation.
- **Inventory Handing:** this module controls the execution of inventory transactions like receiving, picking, shipping, inbound/outbound management and blocking.
- **Inventory Reporting Module:** this module handles the recording and reporting of inventory position per item, warehouse, location, date, Lot or serial no.
- **Inventory Analysis:** analyzing warehouse's positions from logistically and financial perspectives.
- **Lot Control and Serials:** this module control inventory by labeling the material, either by a lot no. or a serial no.

- **Freight Management**

  Freight Management is a Transport Management system (TMS) that handles all shipping related processes like rates, delivery lead-time and transportation orders.

- Freight Master Data (FMD): this module contains all freight-related data such as shipping offices, items, special shipping requirements, transportation routes and so forth.

- Freight Order Control (FOC): this module operates all freight-related activities by handling the freight orders and maintains the loading plan.

- **Rough Planning (RPG):** this module deals mainly with the transportation's capacity.

Beside other modules that concern in Service, Quality Management, Object Data Management and others…

2.9. ERP Implementation Risks:

A common disadvantage for all ERP systems is the high risks associated with the implementation process. If poorly managed, these risks can seriously affect the implementation process leading to either, partial or total failure for the whole project.

An ERP system failure doesn't only mean the loss of resources that have been invested on it. Further and due to its cross-functional nature, improperly implemented system can negatively impact organization's processes.

Cases like Hershey Foods Corporation that spent $112 million on an ERP system to improve its orders' delivery and solve Y2K problem in 1996, then ended up unable to fill Halloween candy orders in October 1999 resulting in 19% drop in third quarter profits (Sedman, 1999), felling in its stock price by third, losing market share to Mars and Nestle (Severance & Passino, 2002) and a 3% permanent decrease in market share (Sutton, 2003) is a live example for how bad ERP complications can be.

Scott (2003) identifies risks in ERP implementations I the areas of project risks, information systems risks, organizational risks and external risks.

- **Project Risks:** mainly provoked from system's customizations which may negatively impact the flow of processes hence the system's performance as a whole. Another risk is the failure of interfacing with legacy systems. Project leadership, limiting project scope, avoiding customization and a phased implementation (rollout) can minimize this risk (Scott, 2003)
- **Information Systems Risks:** are either from a poor configuration of the system itself or the hardware it requires. Multi-vendors and poor coordination between the different applications is another serious risk in this category. Information systems risks can be minimized by avoiding customization, use of data

warehousing for reports and queries and avoiding multivendor implementations (Scott, 2003)

- **Organizational Risks:** involves from a bad implementation and utilization of ERP system applications. Organizational risks can be minimized with training and strong leadership, which assures that sufficient resources are allocated to the project and inspires employees who may resist the implementation (Scott, 2003)
- **External Risks:** involve mainly problems with vendors and consultants.

2.10. Definition of ERP Success:

On an organizational level, the matter of ERP success is relative somehow to the motivations behind adopting the system and the returns it was expecting. However, many studies addressed certain criteria that based on an ERP system can be labeled either as successful or failed. Sneller's study on MRP systems sees that success can be defined in two dimensions: improved performance and user satisfaction. Improved organizational performance mainly in increasing the inventory turnover, increased on-time deliveries, decreased lead times, and decreased material shortage and decrease material expeditors. (White, Anderson, Schroeder and Tupy, 1981). User Satisfaction in terms of functionality, equipment performance, interaction features and office environments. (Gutek, Bikson & Mankin, 1984).

Another study by Lyytinen and Hirschheim's (1987) defined the successes and failures in IT projects into four perspectives:

- **Correspondence success:** achieved through the match between the planned objectives and the IT system being implemented.
- **Process success:** by finishing the implementation within the planned time and budget.
- **Interaction success:** refers to the users' acceptance and interaction with the system.
- **Expectation success:** by meeting the users' expectations.

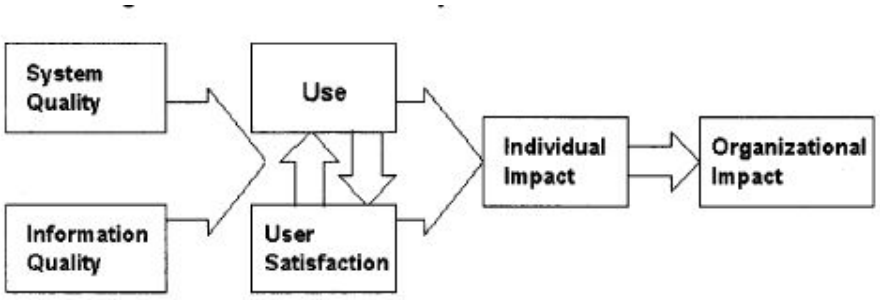
In general, an ERP system success depends on two main aspects: achieving the goals for which ERP systems have been designed for from on side and meeting the user's expectations from another side.

One of the models uses to measure information systems' success has been set by DeLone and McLean in late-80 yet still considered in modern studies. in the period of 1993 through mid-2002, "285 refereed papers in journals and proceeding" referenced the model (W.H. DeLone & McLean, 2003). The model was set after reviewing 180 articles published between 1981 and 1987 and developed a taxonomy and model based on six dimensions of I/S success:

- **Systems Quality:** includes measures of performance such as reliability, response rate, error rate an ease of use.
- **Information Quality:** measures the perceived usefulness and importance of systems output, usually in the form of reports.

- **Use:** mainly the use of information by managers
- **User Satisfaction:** a major and frequently used dimension to measure success. User satisfaction variables are" content, accuracy, format, ease of use and timeliness (Doll, Xia & Torkzadeh, 1994)
- **Individual impact:** the effect of information on the behavior of the recipient which is the most difficult dimension to measure.
- **Organizational Impact:** the impact on organizational performance

Figure 2-11: Information Systems Success Dimensions



From DeLone, W.H. and McLean, E.R. (1992). Information systems success: The quest for the dependent variable, Information Systems Research, 3, 1, pp. 60-95.

2.11. ERP Value Sustenance:

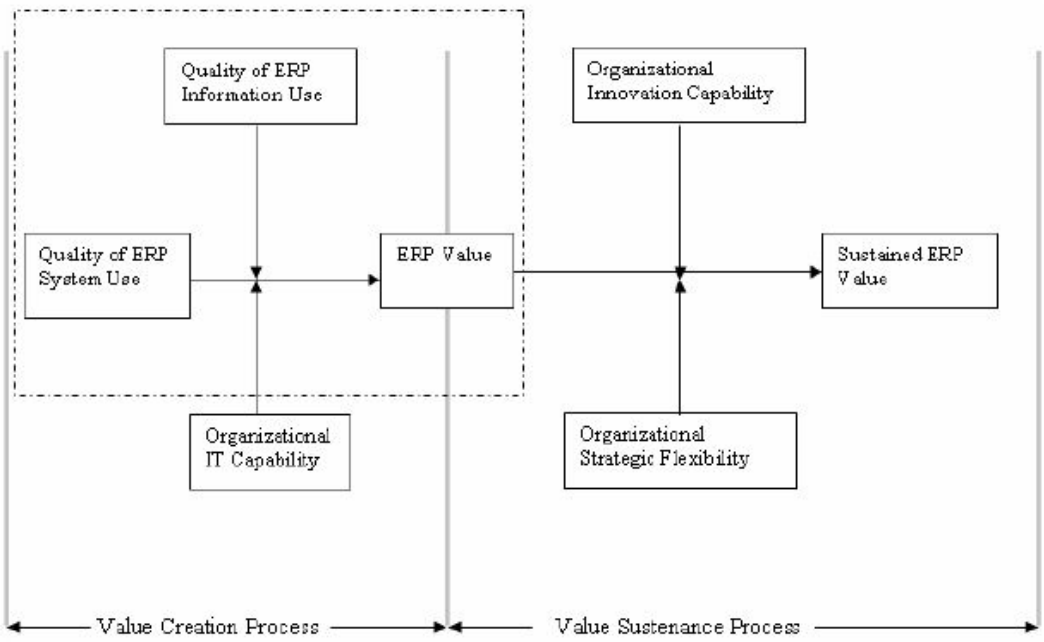
Assuming the success of an ERP system implementation and meeting at least the minimum expectations of implementers, recent concerns have been raised and conservatively handled by some researchers about the sustainability of an ERP system's benefits. Such studies meet major challenges in identifying ERP values, how to be measured then how to be sustained.

The fact that ERP systems cross with organization's processes in many levels and areas make it hard for researchers to accurately define where and what was its impacts. Moreover, chronological difference in realizing ERP benefits where in some benefits can extend to several years after implementing the system plus the tendency of much organization toward a gradual adaptation of ERP system by implementing certain modules then including others in next phases; this makes it even harder to determine when to assess an ERP system's value.

A major concern in ERP sustenance studies is the fact that ERP systems tends to standardize business processes the much possible around best practices which might be a substantial advantage on an organizational wise but certainly not a competitive one. These processes will be available for other organization through similar ERP systems if not the same system. Gattiker and Goodhue (2000) stated that the incorporation of best practices in ERP applications also tends to make operational practices in organizations that implement ERP from the same vendor. Then, there will be no competitive advantage out of the implemented ERP system.

One of the main approaches in this regard is the Dynamic Capabilities required for ERP value sustenance. The dynamic capabilities have been identified as 'organizational and strategic routines by which organizations achieve new resource configurations as markets emerge, collide, split, evolve and die" (Eisenhardt and Martin, 2000). From this stand point, dynamic capabilities are related to the gain and release of resources, including those pertaining to knowledge creation that enables new thinking (Eisenhardt and Martin, 2000). In a study by Jain Vikas (2008), the model below has been developed where two major capabilities have been identified: (1) Organization Innovation and (2) Strategic Flexibility.

Figure 2-12: Creating and Sustaining an ERP System Value



Source: Jain, Vikas, (2008). *A framework for sustainable ERP value*, (Unpublished doctoral dissertation), George Washington University, Washington DC, USA

- **Strategic Flexibility:** Organizational strategic flexibility has been identified as an organization's ability to manage economic and political risks by responding in a proactive or reactive manner to market threats and opportunities (Grewal and Tansuhaj, 2001). Flexibility makes organization able to cope and respond to external and internal changes and threats. Hence, an organization can improve its potential for releasing higher value from its resources as compared to its competitors (Hitt el al., 1998; Volberda, 1998)

- **Innovation Flexibility:** Organization innovation capability refers to an organization's ability to develop new products and processes and achieve superior technological and/or management performance in market (Schumpter, 1934; Rangone, 1999). ERP value that depends on the operational improvement offered

by the system won't sustain long for being easily imitated by competitors. Organization should realize that ERP is a tool whose value can be longer sustained and benefits can maximized when deployed on a continuous developed environment where unique products or processes innovations bloom. Poter (2001) pointed to the inability of tools and techniques alone to be a source of sustained value unless supported by unique activities related to product innovations or product design and marketing.

2.12. Critical Success Factors:

Success is a constant demands for any project that identifies the critical factors that lead to that success have always been a big concern for projects' managements. Critical Success Factors (CSFs) are defined as critical areas where things must go right for a business to flourish (Rockard, 1979) or the activities that make the difference between success and failure-or at least the difference between incremental results and breakthrough results (Banfield, 1999)

Critical factors' studies for enterprise systems success are not new. They were as early as the introducing of MRP systems and consist of a solid ground for modern studies that have more developed systems like ERP systems. One of these studies was conducted by Sneller on 1989 based on the Operational Management Approach described by Koontz et al. (1980) and determined the required managerial function in MRP implementation in terms of planning, organizing, staffing, leading and controlling.

Nah, Zuckweiler and Lau (2003) reviewed 10 articles and identify 11 factors for their study (Table 2-9). Their survey has included chief information officers (CIOs) from Fortune 100 companies and found out that the five most critical factors are top management support, the existence of a project champion, ERP teamwork, project management and a change management program and culture (Nielsen, 2002).

Table2-9: ERP Critical Success Factors proposed by Nah et al. (2003)

	Teamwork	Change Management & Culture	Top Management Support	Business Plan and Vision	Min. Customization	Effective Communication	Project Management	Dev. & Troubleshooting	Performance Evaluation	Project champion	Legacy Systems
Bingi et al. (1999)	X	X	X		X			X			
Buckout et al. (1999)	X		X	X							
Falkowski et al. (1998)	X	X		X		X	X		X	X	
Holland et al. (1999)	X	X	X	X	X	X	X	X	X		X
Roberts and Barrar (1992)		X	X	X	X				X		X
Rosario (2000)	X			X	X	X	X	X	X	X	
Scheer and Haberman (2000)								X			
Stefanou (1999)	X									X	
Sumner (1999)	X	X	X		X	X	X		X	X	
Wee (2000)	X	X	X	X	X	X	X	X			

Note: From "ERP implementation: Chief information officers' perceptions of critical success factors, "by F. Nah, K. M. Zuckweiler, and L. J. Lau, 2003, *International Journal of Human-Computer International, 16*(1), 5-22.

Another study by Laughlin (1999) identified six critical factors for ERP systems implementation:

- A motivating business justification
- Internal business support
- A strong internal owner
- An empowered and influential internal team
- Management driven change
- A proven external partner

Brown and Vessey (2003) identify five success factors based on case of dozen ERP implementations:

- Top management is engaged not just involved
- Project leaders are veterans and team members are decision makers
- Third parties fill gaps in expertise and transfer their knowledge
- Change management goes hand-in-hand with project management
- A satisfying mindset prevails

In their study, Holland and Light (1999) categorized the critical success factors in ERP implementation to strategic and tactical factors:

- Strategic:
    - Legacy systems
    - Business vision
    - ERP strategy
    - Top management support
    - Project schedule and plans
- Tactical:
    - Client consultation
    - Personnel BPC and software configuration
    - Client acceptance
    - Monitoring and feedback
    - Communication
    - Trouble shooting

Umble et al. (2003) in another hand identified 9 critical factors for successful ERP implementation:

- Clear understanding of strategic goals
- Commitment by top management
- Excellent project management
- Organizational change management
- A great implementation team
- Data accuracy
- Extensive education and training

- Focused performance measured
- Multi-site issues

Zhang (2005) stated that the critical success factors for ERP implementation can be classified to:

- Organizational Environment: this is related to the organizational culture, top management support, effective project management and business process reengineering
- User Environment: including the user training, education and involvement
- System Environment: such as system quality, software suitability
- ERP Vendor Environment: which relates to the quality and past performance of the package vendor

In this study and after reviewing the previous studied factors, a group of factors have been perceived as major ones in ERP systems implementation have been considered. These factors were divided into three categories:

2.25.1. Managerial Factors:

Managerial factors refer to participations and activities required by organization's management to enhance ERP implementation success. The main managerial factors viewed in previous literature and considered in this study are:

2.25.1.1. Project Plan and Vision

One of the problems faced in ERP projects is justification the huge resources required to implement it. Nah (2003) stated that one of the biggest problems ERP project leaders face comes not from the implementation itself, but from the expectations of board members, senior staff and other key stakeholders. Thus, a business plan that outlines proposed strategic and tangible benefits, resources, costs, risks and timeline is critical (Wee, 2000) to clearly define where the resources are going to be allocated and what are the reasonable returns from it.

An ERP plan should decide in advance what to do, how to do it, when to do it and who is to do it (Koontz et al., 1980). That may include the establishment of an intentional structure of roles though determination of the activities required to achieve goals of an enterprise and each part of it, the grouping of these activities, the assignment of such groups of activities to a manager, the delegation of authority to carry them out, and provision for coordination of authority and informational relationships horizontally and vertically in the organization structure (Koontz, 1980).

2.25.1.2. System Selection

Selecting the system is practically the first step in ERP project. Organization should take its time and pay an exceptional attention for this step. The last thing an organization need is to end up pumping huge resources in a system that will negatively or, in best cases, will not effect on its performance.

Organization therefore has to carefully identify their needs and translate them to criteria when selecting the system. Rao (2000) urge organizations to consider five major criteria when selecting the system which are: affordability, knowledge of the package supplier, level of offered support, software upgradeability and the use of the latest technology. However, more criteria can be added to cover more specific requirements and needs. Organization should be aware that big system with very advanced applications is not necessarily the best for it, yet a system that can satisfy its requirements within its capabilities has a much bigger chances to succeed. Consultants can greatly help in setting these criteria and selecting the system because of their experience and in-depth knowledge in this field. Organization can test the available systems that match most or these criteria and select the best one.

2.25.1.3. Top Management Support

ERP is costly, time consuming and multi- conceptual system that require an aware, dedicated, patient and supportive top management to survive. The initial support of top management first demonstrated in "the willingness to provide the necessary resources and authority or power for project success (Selvin and Pinto, 1987)".

From a costing wise, ERP is a series of costly phases starting by the expensive software itself, required hardware, consulting and training. Any shortage in funds or a try to cut-down the cost by overstepping certain points would seriously affect the project success or even terminate it.

Another important contribution for top management in ERP project is by setting official policies to grant employees' cooperation, facilitate the implementation process and making the required changes. Moreover, management should delegate some authority to managers to get over the operational and organizational obstacles they likely face during the implementation.

Top management role in following-up and controlling the ERP project implementation is as important as its role in launching and facilitating it. Al-Mashari et al. (2003) stated that top management support does not end with initiation and facilitation, but must extend to the full implementation of the ERP system. Koontz (1980) defines controlling as a "managerial function of measuring and correcting performance of activities of subordinates in order to assure that enterprise objectives and plans are being accomplished". Thus, top management should be kept updated about the project progress so they can maintain, control and correct the implementation process if needed.

2.25.2. Project Factors:

Project factors are directly related to the system itself in terms of managing, installing and training. The main factors in this category are:

2.25.2.1. Project Management

ERP systems are organization-wide projects that deal with many aspects and often require genuine changes; hence a powerful and qualified management that is able to manage, steer and control it is essential for the success of implementation. ERP project managers should enjoy a good technical experience, business knowledge and inter-personal skills. Al-Mashari et al., (2003) stated that "the success of projects is related to the knowledge, skills, abilities and experiences of the project manager as well as the selection of the right team members".

Manager therefore should be able to properly manage the project, set the required and suitable strategies and continuously follow, direct, control and maintain implementation process. According to Dennis Lock (1996), "project management has evolved in order to plan, coordinate and control the complex and diverse activities of modern industrial and commercial projects". Project management should there for set effective strategies.

2.25.2.2. Project Champion

Some studies showed that the present of what called "project champion" found to have a good impact in the flowing of ERP implementation. Project Champion refers to high level executive sponsor existence with power to set goals and control changes (Falkowski et. al., 1998) and continually strive to resolve conflicts and manage resistance (Nah, Lau and Kuang, 2001). Cisco Systems overcame organizational inertia only when its ERP project was "led by the CIO and the vice president of manufacturing, who reported directly to the board of directors (McAfee, 2003)

Many studies examined the best style of leadership in ERP projects. Breath (1991) stated that Project champion should perform the crucial functions of transformational leadership and facilitation while Kvavik et. al. (2004) noted that transformational leadership was associated with organizational effectiveness and effectiveness is one of the goals of ERP technology. Northouse (2004) saw that transformational leadership was a style or a process that changed and transformed individuals and defines transformation in the following term: it is concerned with emotions, values, ethics, standards, long-term goals and includes assessing follower's motives, satisfying their needs and treating them as full human beings.

2.25.2.3. Teamwork and Composition

ERP implementation should be handled to good and well selected candidates. Both business and technical knowledge are essential for succeed (Sumner,1999) and have to receive an enhanced training on both the packaged systems features and related work processes (Lassila & Brancheau, 1999). The ERP project should be their top and only priority and their workload should be manageable (Wee, 2000).

Beside internal staff, studies show that consultants play a key role in ERP projects. Welti (1999) argues that the success of a project depends on the capabilities of the consultants because they have in-depth knowledge of software. Thus, the team should have a mix of consultants and internal staff so the internal staff can develop the necessary technical skills for design and implementation (Semner, 1999).

2.25.2.4. Vendor Support

ERP system differs not only from other information systems but also from an ERP system to another which requires a depth and expert knowledge in the selected system particularly to implement it. Vendors and their trained consultants are usually the only party that acquires such knowledge. Therefore, vendors play a substantial role prior, during and after the implementation.

Vendor should participate in the implementation plan architecting; provide well designed training programs for the organization staff and dedicate specialized consultants with good experience in the system as well as business process to assist the organization throughout implementation phases.

Troubleshooting and responsiveness for organization's needs are things that organization should take in consideration when selecting the system. Rosario (2000) says that "quick response, patience, preservation, problem solving and firefighting capabilities are important" and "the organization implementing ERP should work well with the vendors and consultants to resolve software problems (Holland et. Al., 1999)

Moreover, vendor's support should continue even after implementing the system in terms of maintenance, upgrading the system and training the users on the new version's applications.

2.25.3. Organizational Factors

Organizational factors refer to the organizational, structural and cultural adjustments recommended for a suitable environment for ERP implementation success. These factors mainly include:

2.25.3.1. Business Process Re-Engineering

ERP system have been designed based on best practices the reason why "the existing organizational structure and business processes found in most companies that seeks ERP implementation are not compatible with the structure, tools, and tyoes of information provided by ERP systems" (Umble et. Al., 2003). Robey et.a;., (2002) seems that " problems occur due to possible gaps between the old knowledge embedded in the business practice and processes and between the new business practice and process that ERP system will support". The only way to bridge these gaps would be either by re-engineering the business processes to match those supported by ERP application or customize the system to fit the existed processes.

Studies in general don't support the customization option and sees that the software should not be modified, as far as possible, to reduce errors and to take the advantages of new versions and releases (Sumner, 1999; Rosario,2000). Thus, organization should reengineer it processes instead if it wants to benefits the most from the implemented system.

Hummer and Champy (2001) defines Business Process Re-engineering (BRP) as "the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as, quality, service and speed". Somers and Nelson (2004) stated that BRP plays a significant role in the early stages of implementation and that "business processes reengineering should take place interactively to take the advantages of the improvements from the new system and carried out with new ideas." (Wee, 2000).

While considering the reengineering option, "managing and controlling the quality of business process redesign is extremely important" (Rosario, 2000)

2.25.3.2. Communication

A shared vision of the organization and the role of new system and structures should be communicated to employees (Nah et al., 2001). Communicating ERP project with employees is essential to build awareness about the importance of these projects to the organization. This will enhance them to cooperate with the implementation team and participate in change.

Another important point should be communicated with the employees is how the system will impact their jobs. Sumner (1999) says that managers need to communicate the importance of project, and the employees should be told in advance the scope, objectives, activities and admit the change will occur.

2.25.3.3. User Training and Education

ERP is a hard system to utilize and even harder to implement even for people who have an IT background. Therefore, users have to be intensively trained to avoid any error or confusion during when implementing and using it. Nah et al., (2003) says that sufficient training can assist increase success for ERP systems. Management should focus in training courses and willing to allocate all resources needed for that. By treating resource training with little regard and financial support, it is not hard to realize the reality of delay, confusion and financial ruin that may result. Some companies insist on assigning a fixed cost or percentage to the training effort, regardless of need or variable conditions (Gargeya and Bady, 2005)

Two main training programs have to be settled. A professional and specialized program for the internal team that will handle the implementation process and another one for employees in other departments to educate them about the system, its utilization and its impact on their jobs. Preferably, training shall star earlier than the system implementation to insure that all the users will be qualified to use the system effectively and walk side by side with the implementation consultants to solve any problem may occur during the implementation phase (Zhang et. al., 2003).

The quality of training is very important for a good understanding and proper utilization for the system. Consultants play a key role in this phase by transferring their knowledge to the end users either through training program or interaction during implementation.

2.25.3.4. Organizational Resistance

Changing usually meets resistance and the deeper changing was the more resistance will be. The fact that ERP system requires genuine changes not only on an organization but also in behavioral level, its implementation is likely associated with a big deal of resistance. Zander (1950) (as cited in Dent and Goldberg, 1999, p.34) defined resistance to change as "behavior, which is intended to protect an individual from the effects of real or imagined change".

Education about the importance of ERP systems and awareness on how it will impact business is essential for preparing the employees for change. Lee and Gosain (2005) stated that acknowledging the need for a change is very important as the greater the need for change, the more likely top management and stakeholders will support the ERP implementation.

Aladwani (2001) says that all managers must be charged with the responsibility of controlling worker anxiety and resistance to ERP system. Users must be trained, and concerns must be addressed through regular communication, working with change agents, leveraging corporate culture and identifying job aids for different users (Rosarion, 2000). Moreover, users should be involved in design and implementation of business processes (Holland et al., 1999). The participation of employees in that way would increase their acceptance and satisfaction to the new system.

2.26. **Previous Studies**

2.26.1. Huang, S., (1993), *EPT System and Knowledge Sharing: The Convergence of Efficiency and Flexibility,* (Unpublished doctoral dissertation), Information Management National Center University, Taiwan.

A very important benefit for ERP system that has been poorly handled by previous studies is the improvement on knowledge sharing in ERP adopters' organizations.

The study handled two main issues; the perceived ERP benefits and organizational knowledge sharing effectiveness. A questionnaire has been developed accordingly and 800 copies have been distributed on a random sample.

The study found a significant relationship between ERP implementation and knowledge sharing in two major ways:

- Increasing opportunities to share knowledge
- Enhancing employees' motivations to share knowledge.

2.26.2. Al-Sehali, S., (2000), *The factors that affect the implementation of Enterprise Resource Planning (ERP) in the international Arab gulf states and united states companies with special emphasis on SAP software*, (Unpublished doctoral dissertation), University of Northern Iowa, USA.

Al-sehali's thesis shares the same objective with this study, unfolding the factors that effect ERP projects. However, it differs in population and the chosen ERP system where the study has been applied on companies on Gulf and United States using SAP system.

A random sample with a total of 150 companies, 30 from Gulf and 120 from US, were included. Questionnaire has been used and the return rate was 44.7%.

While this study found that organizational factors were the most important factors in ERP implementation, Al-Sehali's study found that the top management support and involvement consist the major factor in ERP success. Moreover, the study found no differences between Arab Gulf and US companies in regard to the success factors that affect the implementation of an ERP system neither the size of the implementing company.

2.26.3. Hussien, M., (2004). *Developing a Formal Framework for Implementing Enterprise Resource Planning System to Achieve Successful Implementation*, (Unpublished Masters dissertation), University of Jordan, Amman: Jordan

The researcher claims that related studies have intensively examined the success/failure of ERP project; however, none of them have proposed a detailed framework for the implementation presses.

The proposed framework starts by conducting SWOT analysis to the organization's capabilities. GAP analysis should then used be used to determine the gap between ERP systems requirements and organization's capabilities. Developing QFD accordingly to link the organization's capabilities/need with ERP system requirement in order to select the suitable system as well as the activities should considers for the implementation process.

The framework has been applied as a case study to Households & Toiletries Factory.

2.26.4. Bradley, J., (2004). *Enterprise Resource Planning Success: A Management Theory Approach to Critical Success Factors*, (Unpublished doctoral dissertation) Claremont Graduate University, California: USA.

The study tended to examine the critical success factors of ERP implementation in the framework of classical management theory. The operational Management Model which has been developed by Koontz, O'Donnell and Weihrich (1980) has been used to study the managers' functions. This model divided the managers' functions to five major categories: planning, organizing, staffing, leading and controlling. Sneller's test for MRP has been also used to test ERP feasibility. Further hypotheses have been developed based on the literature for the uncovered factors.

Two methods have been used, case studies of eight companies and questionnaire. The eight selected companies for the case studies were implementing ERP for at leas 2 years and used to collect detailed information about the implementation process. Questionnaires have been sent for manufacturing companies whose sales excess $500 million claiming that those are the targeted companies by ERP vendors.

The study found that the experience of the project manager, quantity and quality of training and the effectiveness of project champion are critical factors for a successful ERP implementation. While integration of business processing and IT planning, reporting level of project manager, involvement of general management

or role of management in reducing user resistance have no significant relation with the implementation success.

2.26.5. Mehlinger, L. B., (2006). *Indicators of Successful Enterprise Technology Implementation in Higher Education*, (Unpublished doctoral dissertation), Morgan State University, USA

Researcher sees that as it is the case in commercial businesses, collages and universities do need ERP to integrate all their functional and administrative processes. Thus, this sturdy tended to study the critical success factors for ERP system in higher education institutions.

Due to the fact that ERP implementation is likely accompanied with a strong need for genuine changes, successful implementation would be tightly related to how the stakeholders perceive this system and to what extend they are willing to cooperate and participate in the implementation process. Thus, this research tended to study the people element effect on ERP projects success with a special focus on the organizational culture and the required leadership style.

The study has been applied on 10 campuses in a large university system using two measurement tools:

- A 28-item Organizational Description Questionnaire (ODQ) designed by Avolio and Bass. The instrument has been used to assess the institutions' cultures in light of leadership style; transformational or transactional culture and included 105 employees
- A 43-item check list designed by the researcher based on previous studies about CSFs.

The study found a low or no impact of the organizational culture on the ERP implementation success. Whatever, a combination of both, transformational and transactional cultures, were associated with successful performance.

2.26.6. **Juel-Skielse, G., (2006). *ERP Adoption in Small and Medium Sized Enterprises*, (Unpublished master dissertation). The Royal Institute of Technology, Stockholm: Sweden.**

This study tended to assess the adaptation of ERP among small and medium sized companies and the critical factors that lead to an effective utilization of this system.

An Internet based survey has been used. The study covered 150 companies out of the 821 found in Kista Science City. These 150 companies have been chosen randomly.

The results showed:

- A significant relationship between level of adaptation of an ERP system and organizational effectiveness.
- Effective communication, ERP teamwork composition, benefits evaluation, minimum package adjustments and configuration, test and correction are positively correlated with most of measures used to assess the organization performance.
- Monitoring and evaluation of business benefits had a greater effect on performance than monitoring and evaluation of project.
- Minimum package adjustments had greater effect on performance than BPR and organizational adjustments.

2.26.7. **Wickmasinghe, J., (2007), *The Value Relevance of enterprise resource Planning Information,* (Unpublished doctoral dissertation), Bond University, Australia.**

This study tends to develop a theory that evaluates the value brought by ERP systems. The represented model consisted of two phases:

- First phase: a model for forecasting normal performance
- Second phase: tests the value relevance of ERP information

Results show that there were no significant earnings in the first and second year of ERP performance. The study even found that companies might witness negative impact out of their ERP systems. However, positive significant earnings have been attained by the fourth and fifth year.

This study is really important when justifying and planning for an ERP project. A well designed plan based on studies like this would greatly enhance the success of system's implementation.

2.26.8. **Kalbasi, H., (2007).** ***Assessing ERP Implementation Critical Success Factors,*** **(Unpublished masters dissertation). Tarbiat Modares University, Tehran: Iran.**

This research tended to study the main factors that affect the success of an ERP implementation. The research proposed a framework in light of the following factors:

- Working with functionality/maintained scope.
- Project team/management support/consultant.
- Internal readiness/training.
- Planning/development/Budgeting.
- Adequate testing.

The researcher considered case study methodology for that sake. Two companies that have been implemented ERP for more that a year has been chosen.

Semi-structured interviews have been used at various levels of the chosen organizations to collect the required data.

The research found that worked with functionality, maintained scope, project team, management support, consultants, internal readiness, training, planning and adequate testing are critical factors for success while dealing with organizational diversity, development and budgeting are found as important but not critical, mainly because they are hard to be controlled.

2.26.9. **Vicas, J., (2008),** ***A Framework for Sustainable Value*****, (Unpublished doctoral dissertation). The George Washington University.**

The researcher sees that Information Systems are making a considerable portion from organizations investments. Thus, the concerns in this regard should extend the success of implementing such systems to cover the port-implementation phases.

This study tended to figure the capabilities that help an organization to create value out of an ERP system and, moreover, the capabilities that sustain that value.

A structure has been developed accordingly and studied by a survey that covered 251implementations in India. The study found that the quality of ERP

system use, quality of ERP information use and organizational IT capability have a significant effect on ERP value. However, study results provide only partial support for the importance of organizational innovation capability and organizational strategic flexibility in sustaining ERP value.

Chapter Three: *Methodology*

In accordance with the study's problem and objective, this chapter outlines the instrument and procedures used to collect and analyze the required data. This chapter includes:

3.1. The Study Approach.
3.2. The Study Population.
3.3. The Study Sample
3.4. The Study Model
3.5. The study variables.
3.6. The Study Instrument.
3.7. The Instrument Reliability
3.8. Procedures of The Study.
3.9. Statistical Design of Study.

3.1. The Study Approach:

According to Yin (2003), the purpose of an academic study can be exploratory, descriptive or explanatory.

- Exploratory studies are practical if you wish to clarify your understanding of a problem (Saunders, Lewis & Thornhill, 2000). Robson (1993) describes exploratory studies as a method of finding out "what is happening; to seek new insights, to ask questions and to assess phenomena in a new light".
- Descriptive studies are appropriate when you wish to portray a phenomenon such as events, situations or process. Furthermore, a descriptive is also appropriate when a problem is clearly structured, but the intention is not conduct research about the connections between causes and symptoms.
- Explanatory studies are useful when you wish to establish causal relationships between variables. The emphasis in this sort of study is to examine a situation or a problem in order to explain the relationships between variables (Saunders, Lewis & Thornhill, 2000)

Considering the requirements and objectives that have been discusses before, this study therefore fall in the last category. On one hand, it tends to examine the current relationship between the success of ERP implementation and the independent variables that have been defined earlier.

On the other hand, the study will be descriptive in certain aspects especially in the theoretical part in order to portray the ERP implementation project and difficulties of the organizations are likely to go through during the implementation process.

3.2. The Study Population:

Despite the wide variety of ERP systems available nowadays enhanced with specialized modules and applications to serve specific processes in specific sectors, ERP systems were originally evolved from material management systems that concern mainly in improving inventory management, production, planning, procurements and logistics. Thus, ERP benefits are expected to emerge the most in industrial organizations with plenty of functions that need to be well organized, streamlined and integrated which is the core of ERP.

Among the available vendors and packages, Baan LN. system found to be number one ERP system for manufacturing/industrial sector according to a study revealed by Gartner Inc. on 2005.

For these reasons, Jordanian manufacturing organizations implement a Baan LN. system is perceived convenient; hence, considered the population for this study.

The Jordanian manufacturing organizations that implement a Baan LN. system have been obtained from the only Infor Co. partner in Jordan; Electronic Resources Planning Co. Only three organizations match and they are:

- **Middle East Complex for Eng., Electronics and Heavy Industries PLC**. Is one of leading manufacturing in Jordan that deals with producing and trading of global brands such as LG and Daewoo as well as manufacturing, assembling and marketing of it own brands. The company has been established in 1994 and enjoy 75% market share. The number of employeesin this company is 680.

- **International Tobacco and Cigarettes** Co is a limited liability company and a subsidiary of the Eqbal Investment Company PLC that has been established 1992. ITC occupies 40% of the Jordanian cigarettes and tobacco market beside its regional exports. The number of employees in this company is 261.

- **Pharma International**. Is a pharmaceutical company that has been founded by Jordanian and Emirate partners in 2000 and comes as the fifth largest generic pharmaceutical company in Jordan and serves more than 20 markets. The number of employees in this company is 542.

3.3. The Study Sample:

Sampling is an effective procedure a researcher can use to target a specific group in his study population either for being the best source for the required data or to reduce the amount of collected data in case of big population. Saunders and Thornhill, (2000) define sampling as techniques provide a range of methods that enable you to reduce the amount of data you need to collect by considering only data from sub-group rather than all possible cases or elements.

For the purpose of this study, only three companies that implement ERP Baan LN system in Jordan are included. Because the population is not big and limited persons can provide the required information since respondents should have a good knowledge and interaction with ERP implementation, a purposive or judgmental sample will be consider to target the best group who thought to be the best for proving the required data.

Purposive sampling or judgmental sampling is a non-probability sampling technique that done without chance-selecting procedures and allow researcher to select best sample that suits its study. This technique often used when dealing with small samples. In this study, the targeted sample was the departments and unit managers, IT staff and employees known in their involvement in ERP implementation either being involved in the plan design or in handling coding and supervising certain entries on the system. The distribution of the questionnaires was as below:

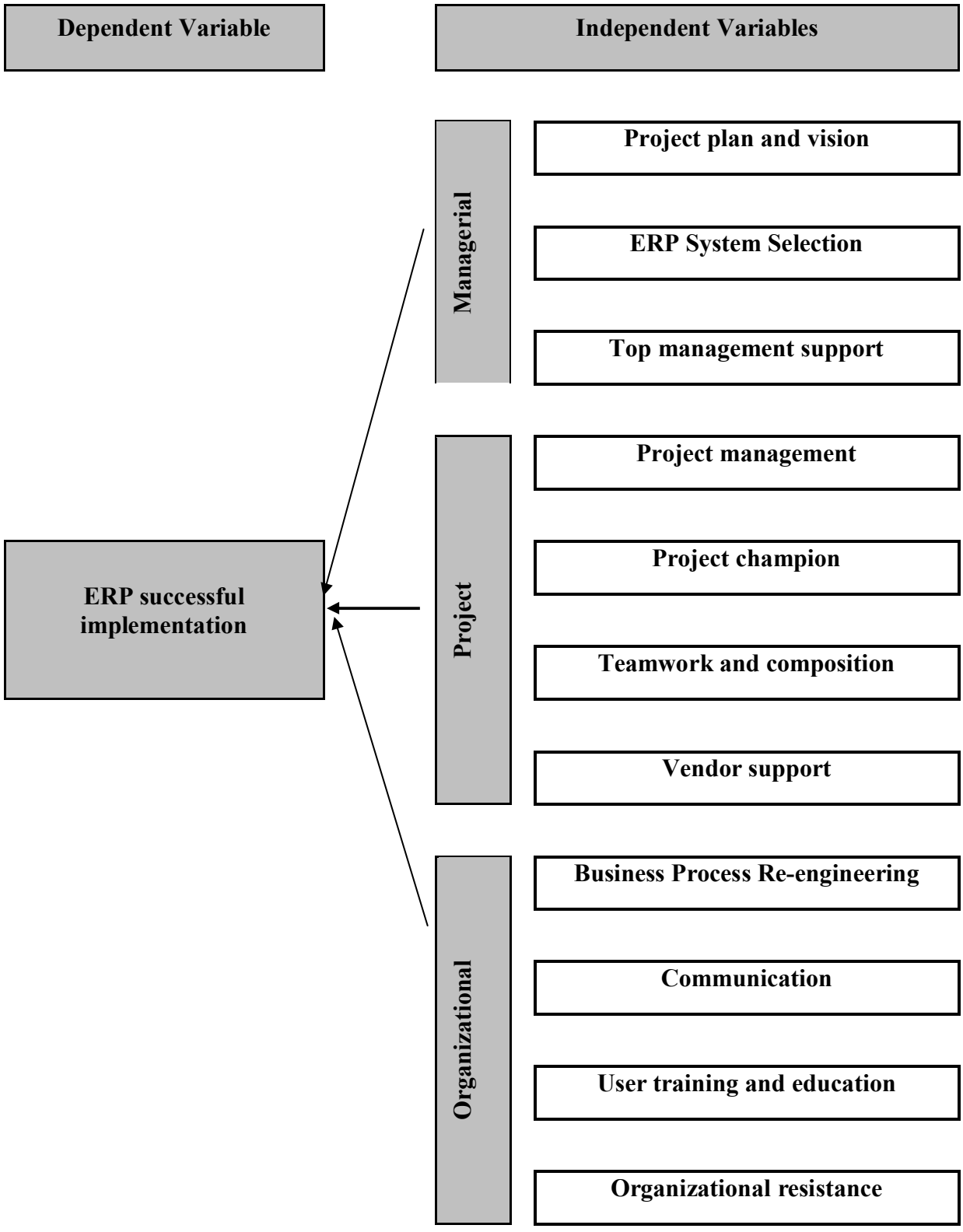
- 120 questionnaires have been distributed in the three companies.
- 107 questionnaires have been returned.
- 7 questionnaires have been excluded for being incompletely filled by respondents.
- 100 questionnaires have been used in the statistical analysis.

Therefore, the return rate was 83.33%.

3.4. The Study Model

According to the dependent and independent variables of the study, the study model has been set by the researcher (Figure 3-1)

Figure 3-1: The Study Model



3.5. The Study Variable:

After reviewing the related literature and previous studies, the critical factors that may affect ERP systems' implementation can be divided into three main categories:

3.5.1. Managerial Factors

3.5.1.1. Project Plan and Vision:

The project plan and vision refer to the awareness of top management about ERP systems benefits, costs, risks and the gained value and objectives if being implemented in their organization. It's important to top management to be aware in all these elements to justify the huge resources that need to be allocated in ERP project and determine its feasibility to the organization accordingly.

3.5.1.2. System Selection:

ERP selection refers to the steps should been made to ensure selecting the most suitable system for an organization. Setting criteria that accurately reflect the organization needs and capabilities then analyzing the matching systems are perceived to be critical for selecting a relevant system.

3.5.1.3. Top Management Support:

Top Management Support refers to all required activities, involvement and commitments of top managers to facilitate an ERP system implementation. Top management support would mainly include their willing to provide all required resources, enhancing employees to cooperate, following the implementation process and interfering if any corrections were needed.

3.5.2. Project Factors

3.5.2.1. Project Management:

Project Management refers to the qualifications, capabilities and attitudes of managers who handle the implementation process. Project managers should have a deep knowledge in both, technical and managerial issues. Social and communication skills are also required to properly promote the system and enhance employees to cooperate.

3.5.2.2. Project Champion:

A number of previous studies have found that the presence of an empowered personnel to promote the system in top management and get their support greatly increase the chances to ERP projects' success. This personnel would be from a high executive level and has a good relation and impact on top management.

3.5.2.3. Teamwork and Composition:

This factor refers to the best composition of the implementation team that makes it more capable to implement the system successfully. ERP implementation team should be mix between internal staff and consultants by which organization can take advantage of consultants' experience in implementing the system from one hand and enhance their internal staff knowledge from the other hand.

3.5.2.4. Vendor Support:

Vendor support refers to the activities, efforts, services and support provided by vendor before, during and after the implementation. Vendor has the specialized knowledge and experience in ERP project and deploying is necessary to ensure that the implementation process is being done properly.

3.5.3. Organizational Factors:

3.5.3.1. Business Process Reengineering:

Business Processes reengineering refers to the adjustments an organization makes to fit ERP projects' applications. The core of ERP systems is to streamline the existing processes to be more efficient. The more an organization can deploy and match ERP requirements the more benefits it will reap from it.

3.5.3.2. Communication:

Communication refers to the procedures an organization took to spread ERP knowledge among its employees and prepare them to utilizing the system. Communication should first generate awareness about ERP importance and benefits for organization then its impact on the different processes and jobs' descriptions.

3.5.3.3. Users training and Education:

Refers to the training courses an organization should provide for its employees. Internal staff should be involved in an intensive and specialized training to enhance their capability to implement the system another organization-wide training course should be placed to educate the rest of employees and prepare them to utilizing the system in their jobs. These courses should be well designed and handled by highly qualified personnel and consultants.

3.5.3.4. Organizational Resistance

Organization Resistance control refers to the activities and procedure done by the organization to prepare their employees to the chance and enhance them to cooperate with the implementation team. Communicating the system with employees, training them and getting them involved in the plan design are all elements that can reduce employees resistance to the system.

3.6. The Study Instrument:

Survey method has been considered in this study and a questionnaire was developed for collecting the required data.

The questionnaire of this study consisted of three parts:

- First part: includes general questions (i.e. gender, age, educational level and current position) to define the sample's characteristics.
- Second Part: consisted of 3 questions to examine the success of ERP implementation in the studied companies.
- Third part: consisted of 53 questions to examine the proposed model in this study. Questions have been placed after reviewing related literatures and previous studies and Likert scale has been used to measure the agreement /disagreement of the study's sample on the questionnaires clauses.

Questions were divided into three main categories in accordance with the research model:

- Managerial factors that examine essential managerial activities such as planning, selecting the system and supporting the implementation process and their effect on ERP project success.
- Project factors examine the variables that are directly related to the project and its management
- Organizational factors to examine the organization-wide processes that should be done to facilitate the implementation process and reduce the resistance toward the system.

An average of 3 to 5 questions has been placed for each variable.

3.7. The Instrument Validity & Reliability

The reliability analysis applied the level of Cronbach Alpha (α) as the criteria of internal consistency. Which were at a minimum acceptable level (Alpha ≥ 0.65) suggested by (Sekaran, 2003). The overall Cronbach Alpha (α) = (95.3). Wheres the high level of Cronbach Alpha (α) is to Organizational Resistance = (86.3). The lowest level of Cronbach Alpha (α) is to Top Management Support = (72). These results an acceptable level suggested by (Sekaran, 2003). The results were shown in Table (3-1).

Table 3-1: Reliability for the Questionnaire Dimensions

	No.	Dimensions	Alpha Value (α)
Managerial Factors	1	Project Plan and Vision	80.8
	2	ERP System Selection	73.2
	3	Top Management Support	72
Project Factors	1	Project Management	79.4
	2	Project Champion	79.6
	3	Teamwork and Composition	75.7
	4	Vendor Support	79.7
Organizational Factors	1	Business Process Re-engineering	83.2
	2	Communication	83.8
	3	User Training and Education	80.2
	4	Organizational Resistance	86.3
ALL Questionnaire			95.3

3.8. Procedures of The Study:

Phone calls and personal meetings have been conducted in an early stage of the study with Human Resources Managers in the three companies to define the total employees' numbers and the contacts of personnel who will be included in the study.

Questionnaires have been distributed accordingly either by hand, email and fax. The follow up with study's sample was by phone calls and email reminders to enhance them to respond. Filled questionnaire have then collected also by hand, emails and fax.

3.9. Statistical Design of Study

Data from the returned responses collected for the analysis and conclusions of the study questions. The researcher used the Statistical Package for the Social Sciences SPSS computer program to analyze the data. Finally, the researchers used the suitable Statistical methods that consist of:

- Cronbach Alpha (α) to test Reliability.
- Percentage and Frequency.
- Arithmetic Mean and Standard Deviation to answer the study questions.
- One Sample T Test.
- Relative important, that assigning due to:

$$\text{Class Interval} = \frac{\text{Maximum Class} - \text{Minimum Class}}{\text{Number of Level}}$$

$$\text{Class Interval} = \frac{5-1}{3} = \frac{4}{3} = 1.33$$

The Low degree from 1- less than 2.33

The Median degree from 2.33 – 3.66

The High degree from 3.67 above.

Chapter Four: *Analysis of Results & Hypothesis Test*

This chapter describes the results of the statistical analysis of the data collection for research question and research hypothesis. The data analysis included a description of the means and standard deviations for study questions. This chapter contains:

4.1. The Study's Sample Description

4.2. The Study Questions Answer

4.3. The Study Hypothesis Test

4.1. The Study's Sample Description:

Table (4.1) shows the demographic variables to study sample from Gender; Age; Educate Level; Specialization and Experience.

Table (4-1) Descriptive the demographic variables to study sample

No.	Variables	Categorization	Frequency	Percent
1	Gender	Male	76	76
		Female	24	24
2	Age	Less than 30 years	18	18
		Between 30 – 40 Years	31	31
		Between 41 – 50 years	30	30
		Above 51 Years	21	21
3	Educational Level	High School	2	2
		Diplomat	5	5
		Bsc	81	81
		Master	12	12
		Phd	-	-
		Others	-	-
4	Current Position	General Manager	-	-
		Department Manager	25	25
		Unit Manager	42	42
		Employee	33	33
5	Years of Experience	Less than 5 years	26	26
		From 5 to 10 years	22	22
		From 11 to 15 years	12	12
		More than 16 years	40	40

4.2. The Study Questions Answer

4.2.1. Question One: *Was the ERP system implemented successfully?*

To answer this question the researcher uses the arithmetic mean, standard deviation, item important and important level as shown in Table (4-2).

Table (4-2)

Arithmetic mean, standard deviation, item important and important level to ERP Implementation Success

No.	ERP Implementation Success	Mean	Standard deviation	Rank	Importance level
1	Organization set a well designed plan that addressed the activities for implementing the system	3.82	0.79	2	high
2	Organization has selected a relevant system	3.79	0.63	3	high
3	Redesigned processes have been properly controlled	3.78	0.85	1	high
General Arithmetic mean and standard deviation		3.8	0.55		

As shown in table (4-2), the average arithmetic mean is 3.8 wich indicates a high success level.

4.2.2. Question Two: *What are the most critical factors that have impact on ERP system implementation? To answer these question the researcher splitting to three sub questions:*

4.2.2.1. Subquestion One: What are the most Managerial factors that have impact on ERP system implementation? To answer these question the researcher splitting to There subquestions:

4.2.2.1.1. Subquestion 1-1: Does Project Plan and Vision have an impact on ERP system implementation?

To answer this question the researcher uses the arithmetic mean, standard deviation, item important and important level as shown in Table (4-3).

Table (4-3)

Arithmetic mean, standard deviation, item important and important level to Project Plan and Vision

No.	Project Plan and Vision	Mean	Standard deviation	Item important	Important level
1	Organization has a clear vision about the ERP project and how it will impact its performance	4.38	0.71	3	high
2	Organization determined the budget it's willing to allocate in ERP project.	4.51	0.59	1	high
3	Organization addressed the possible risks associated with ERP project	4.09	0.73	4	high
4	Organization addressed the desired and expected benefits from ERP business.	4.40	0.59	2	high
5	A new organizational structure has been designed to fit the flow of activities	3.53	0.97	5	Median
General Arithmetic mean and standard deviation		4.18	0.71		

Table (4-3) shows the importance level of Project Plan and Vision, where the arithmetic means range between (3.53 - 4.51) comparing with General Arithmetic mean amount of (4.14). We observe that the high mean was to item "Organization determined the budget it's willing to allocate in ERP project." with arithmetic mean (4.51) and Standard deviation (0.59). While the lowest arithmetic mean was to item" A new organizational structure has been designed to fit the flow of activities" With Average (3.53) and Standard deviation (0.97). In the general the important level of Project Plan and Vision was high.

4.2.1.2. Subquestion 1-2: Does ERP System Selection that has impact on ERP system implementation?

To answer this question the researcher uses the arithmetic mean, standard deviation, item important and important level as shown in Table (4-4).

Table (4-4)

Arithmetic mean, standard deviation, item important and important level to ERP System Selection

No.	ERP System Selection	Mean	Standard deviation	Item important	Important level
1	Organization carefully set the criteria which have been used to select the system	4.36	0.75	1	high
2	Organization has carefully screened all the available systems	3.88	0.90	3	high
3	Organization has back up of specialized consultants to help in the system selection	3.95	0.97	2	high
5	The selected system was introduced /presented to organization by vendor	3.37	1.00	5	Median
General Arithmetic mean and standard deviation		3.89	0.9		

Table (4-4) shows the importance level of ERP System Selection, where the arithmetic means range between (4.36 - 3.37) comparing with General Arithmetic mean amount of (3.87). We observe that the high mean was to item "Organization carefully set the criteria which have been used to select the system " with arithmetic mean (4.36) and

Standard deviation (0.75). While the lowest arithmetic mean was to item" The selected system was introduced /presented to organization by vendor " With Average (3.37) and Standard deviation (1.00). In the general the important level of ERP System Selection high.

4.2.1.3. Subquestion 1-3: What is the most Top Management Support that has impact on ERP system implementation?

To answer this question the researcher uses the arithmetic mean, standard deviation, item important and important level as shown in Table (4-5).

Table (4-5)

Arithmetic mean, standard deviation, item important and important level to Top Management Support

No.	Top Management Support	Mean	Standard deviation	Rank	Importance level
1	Top management has allocated all the required resources for ERP implementation	4.28	0.67	1	high
2	Top management has delegated implementation authority for project managers	4.13	0.76	2	high
3	Top management has set official policies	4.11	0.82	3	high
4	Top management was updated with the implementation process progress	3.69	0.75	5	high
5	Top management interferes and correct the implementation process if needed	3.85	0.83	4	high
General Arithmetic mean and standard deviation		4.01	0.53		

Table (4-5) shows the importance level of Top Management Support, where the arithmetic means range between (3.69 - 4.28) comparing with General Arithmetic mean amount of (4.01). We observe that the high mean was to item “Top management has

allocated all the required resources for ERP implementation" with arithmetic mean (4.28) and Standard deviation (0.67). While the lowest arithmetic mean was to item"Top management was updated with the implementation process progress" With Average (3.69) and Standard deviation (0.75). In the general the important level of Top Management Support high.

4.2.2. Subquestion Two: What are the most Project factors that have impact on ERP system implementation? To answer this question the researcher splitting to three subquestions:

4.2.2.1. Subquestion 2-1: Does Project Management have an impact on ERP system implementation?

To answer this question the researcher uses the arithmetic mean, standard deviation, item important and important level as shown in Table (4-6).

Table (4-6)

Arithmetic mean, standard deviation, item important and important level to Project Management

No.	Project Management	Mean	Standard deviation	Rank	Importance level
1	Project managers had good technical experience	4.66	0.62	1	high
2	Project managers had a good knowledge in business processes	4.09	0.75	3	high
3	Project managers had a good attitudes and inter-personal skills	4.21	0.83	2	high
4	Project managers communicated the project strategies with employees in a friendly way	3.97	0.82	4	high
5	Project managers have set good strategies for ERP implementation	3.93	0.71	5	high
General Arithmetic mean and standard deviation		4.17	0.56		

Table (4-6) shows the importance level of Project Management, where the arithmetic means range between (3.93 - 4.66) comparing with General Arithmetic mean amount of (4.17). We observe that the high mean was to item "Project managers had good technical experience" with arithmetic mean (4.66) and Standard deviation (0.62). While the lowest arithmetic mean was to item" Project managers have set good strategies for ERP implementation" With Average (3.93) and Standard deviation (0.71). In general the important level of Project Management was high.

4.2.2.2. Subquestion 2-2: Does the presence of a Project Champion have an impact on ERP system implementation?

To answer this question the researcher uses the arithmetic mean, standard deviation, item important and important level as shown in Table (4-7).

Table (4-7)

Arithmetic mean, standard deviation, item important and important level to Project Champion

No.	Project Champion	Mean	Standard deviation	Rank	Importance level
1	ERP project was leading by a high level executive	4.50	0.61	1	high
2	Project leader promoted the project in top management and get their support	4.41	0.67	2	high
3	Project manager has been a model for employees working behavior	3.63	0.72	5	Median
4	Project manager was capable to motivate employees and enhance them to change	3.90	0.75	4	high
5	Project leader strives to solve problems faced during implementation	4.29	0.73	3	high
General Arithmetic mean and standard deviation		4.15	0.52		

Table (4-7) shows the importance level of Project Champion, where the arithmetic means range between (3.63 - 4.50) comparing with General Arithmetic mean amount of (4.15). We observe that the high mean was to item "ERP project was leading by a high level executive" with arithmetic mean (4.50) and Standard deviation (0.61). While the lowest arithmetic mean was to item "Project manager has been a model for employees working behavior" with Average (3.63) and Standard deviation (0.72). In general the important level of Project Champion was high.

4.2.2.3. Subquestion 2-3: Do Teamwork and Composition have an impact on ERP system implementation?

To answer this question, the researcher uses the arithmetic mean, standard deviation, item important and important level as shown in Table (4-8).

Table (4-8)

Arithmetic mean, standard deviation, item important and important level to Teamwork and Composition

No.	Teamwork and Composition	Mean	Standard deviation	Rank	Importance level
1	The team members has carefully been selected	4.23	0.85	3	high
2	The team members enjoyed business and technical knowledge	3.68	0.68	5	high
3	The team member have been trained on system and related business processes	4.51	0.66	2	high
4	The ERP project has been the top and only priority for the team.	4.07	0.79	4	high
5	Business team work was a mix of consultants and internal staff	4.56	0.64	1	high
General Arithmetic mean and standard deviation		4.21	0.52		

Table (4-8) shows the importance level of Teamwork and Composition, where the arithmetic means range between (3.68 - 4.56) comparing with General Arithmetic mean

amount of (4.21). We observe that the high mean was to item "Business team work was a mix of consultants and internal staff" with arithmetic mean (4.56) and Standerd deviation (0.64). While the lowest arithmetic mean was to item"The team members enjoyed business and technical knowledge" With Average (3.68) and Standerd deviation (0.68). In general the important level of Teamwork and Composition was high.

4.2.2.4. Subquestion 2-4: Does Vendor Support have an impact on ERP system implementation?

To answer this question, the researcher uses the arithmetic mean, standard deviation, item important and important level as shown in Table (4-9).

Table (4-9)

Arithmetic mean, standard deviation, item important and important level to Vendor Support

No.	Vendor Support	Mean	Standard deviation	Rank	Importance level
1	Vendor participated in the implementation plan architecting (design)	4.26	0.69	1	high
2	Vendor consultants have offered well designed and intensive training programs for end users	4.25	0.67	2	high
3	Vendor was ready to solve and troubleshooting any technical or procedural problem during the implementation	4.13	0.60	3	high
4	Vendor has a quick response to organization needs	3.88	0.67	5	high
5	Vendor's support has continued even after implementing the system in terms of maintenance and upgrading the system	4.08	0.81	4	high
General Arithmetic mean and standard deviation		4.12	0.51		

Table (4-9) shows the importance level of Vendor Support, where the arithmetic means range between (3.88 - 4.26) comparing with General Arithmetic mean amount of (4.12). We observe that the high mean was to item "Vendor participated in the implementation plan architecting (design)" with arithmetic mean (4.26) and Standard deviation (0.69). While the lowest arithmetic mean was to item"Vendor has a quick response to organization needs" With Average (3.88) and Standard deviation (0.67). In general the important level of Vendor Support Vendor Support was high.

4.2.3. Subquestion Three: What are the most organizational factors that have impact on ERP system implementation? To answer this question, the researcher split into four subquestions:

4.2.3.1. Subquestion 3-1: Does Business Process Re-engineering have an impact on ERP system implementation?

To answer this question the researcher uses the arithmetic mean, standard deviation, item important and important level as shown in Table (4-10).

Table (4-10)

Arithmetic mean, standard deviation, item important and important level to Business Process Re-engineering

No.	Business Process Re-engineering	Mean	Standard deviation	Rank	Importance level
1	Some business processes have been modified to fit the ERP applications	4.19	0.80	1	high
2	Limited amendments have been done on the system	3.60	0.74	2	high
3	Changes in organizational structure have been done smoothly	2.91	0.81	4	Median
4	Specialized consultations have been utilized successfully to change the existing processes	3.36	1.03	3	high
General Arithmetic mean and standard deviation		3.5	0.84		

Table (4-10) shows the important level of Business Process Re-engineering, where the arithmetic means range between (2.91 - 4.19) comparing with General Arithmetic mean amount of (3.58). We observe that the high mean was to item "Some business processes have been modified to fit the ERP applications" with arithmetic mean (4.19) and Standard deviation (0.80). While the lowest arithmetic mean was to item"Changes in organizational structure have been done smoothly" With Average (2.91) and Standard deviation (0.81). In general, the important level of Business Process Re-engineering was Median.

4.2.3.2. Subquestion 3-2: Does Communication have an impact on ERP system implementation?

To answer this question, the researcher uses the arithmetic mean, standard deviation, item important and important level as shown in Table (4-11).

Table (4-11)

Arithmetic mean, standard deviation, item important and important level to Communication

No.	Communication	Mean	Standard deviation	Rank	Importance level
1	Employees were aware of the huge resources the organization has been allocated in ERP system	4.27	0.79	1	high
2	Employees have been educated about the system benefits in business	3.82	0.83	4	high
3	Employees were aware of the importance of the system for the organization	3.89	0.75	3	high
4	Employees were aware of the organizational and structural changes will likely be associated with ERP system	3.60	0.72	5	Median
5	Organization has communicated the systems objectives with the employees and its impact on their jobs.	4.12	0.77	2	high
General Arithmetic mean and standard deviation		3.94	0.60		

Table (4-11) shows the importance level of Communication, where the arithmetic means range between (3.60 - 4.27) comparing with General Arithmetic mean amount of (3.94). We observe that the high mean was to item "Employees were aware about the huge resources the organization has been allocated in ERP system" with arithmetic mean (4.27) and Standard deviation (0.79). While the lowest arithmetic mean was to item" Employees were aware about the organizational and structural changes will likely be associated with ERP system" with Average (3.60) and Standerd deviation (0.72). In general, the important level of Communication was high.

4.2.3.3. Subquestion 3-3: Do Training and Education have an impact on ERP system implementation?

To answer this question, the researcher uses the arithmetic mean, standard deviation, item important and important level as shown in Table (4-12).

Table (4-12)

Arithmetic mean, standard deviation, item important and important level to Training and Education

No.	Training and Education	Mean	Standard deviation	Rank	Importance level
1	Organization has provided all resources required for training	4.25	0.64	2	high
2	Internal staff has been intensively trained on the system	4.44	0.70	1	high
3	An organization-wide training program has been placed and all employees where involved	3.92	0.86	4	high
4	Training program was handled by highly qualified consultants and trainers	4.00	0.84	3	high
5	Training programs where properly and well designed for end-users.	3.63	0.68	5	Median
General Arithmetic mean and standard deviation		4.05	0.56		

Table (4-12) shows the importance level of Training and Education, where the arithmetic means range between (3.63 - 4.44) comparing with General Arithmetic mean

amount of (4.05). We observe that the high mean was to item "Internal staff has been intensively trained on the system" with arithmetic mean (4.44) and Standard deviation (0.70). While the lowest arithmetic mean was to item"Training programs where properly and well designed for end-users" with Average (3.63) and Standerd deviation (0.68). In general, the important level of Training and Education was high.

4.2.3.4. Subquestion 3-4: Does Organizational Resistance management have an impact on ERP system implementation?

To answer this question, the researcher uses the arithmetic mean, standard deviation, item important and important level as shown in Table (4-13).

Table (4-13)

Arithmetic mean, standard deviation, item important and important level to Organizational Resistance

No.	Organizational Resistance management	Mean	Standard deviation	Rank	Importance level
1	Employees were aware of the change and ready to deal with	3.59	0.96	4	Median
2	Employees were previewed with ERP utilization before start using it through training.	4.12	0.81	1	high
3	Employees have been involved in the design of the new business processes and satisfied with it.	3.57	1.12	5	Median
4	Employees concerns have been seriously handled and answered by top management	3.61	1.10	3	Median
5	Employees were educated about the importance of ERP system and motivated to use it.	3.80	0.71	2	high
General Arithmetic mean and standard deviation		3.74	0.77		

Table (4-13) shows the importance level of Organizational Resistance management, where the arithmetic means range between (3.57 - 4.12) comparing with General Arithmetic mean amount of (3.74). We observe that the high mean was to item "Employees were previewed with ERP utilization before start using it through training" with arithmetic mean (4.12) and Standerd deviation (0.81). While the lowest arithmetic mean was to item"Employees have been involved in the design of the new business processes and satisfied with it" with Average (3.57) and Standerd deviation (1.12). In general, the important level of Organizational Resistance was high.

4.3. Study Hypothesis Test

The researcher, in this side tested the main hypothesis and study subhypothesis. Through Simple Liner, Multiple Regression analysis with (T) test using ANOVA table. As follows:

HO1: There is no significant relationship between managerial factors (Project plan and vision, ERP System Selection and Top Management Support) and the success of ERP system implementation at level ($\alpha \geq 0.05$).

To test this hypothesis, the researcher uses the One sample T test to ensure the Impact of managerial factors in success of ERP system implementation. As shown in Table (4-14).

Table (4-14)

One sample T test results to test Impact of managerial factors in success of ERP system implementation

	N	Mean	Standard deviation	T Calculate	T Tabled	Degree of freedom	Sig*
Impact of managerial factors in success of ERP system implementation	100	4.03	0.437	23.195	1.960	99	0.000

* the Impact is significant at level ($\alpha \geq 0.05$)

Table (4-14) shows there is a significant impact of managerial factors in the success of ERP system implementation. The *T* Calculate was (23.195) at level ($\alpha \leq 0.05$) comparing with *T* Tabled was (1.980). And that Assuring unvalid first main hypothesis. Unaccepted null hypotheses and accepted alternative hypotheses:

There is a significant relationship between managerial factors and the success of ERP system implementation at level ($\alpha \geq 0.05$).

To ensure the impact of managerial factors in the success of ERP system implementation, the researcher dividing the first main hypothesis to three subhypotheses, and uses the One sample T test to test each subhypothesis as a following:

***HO1-1*: There is no significant relationship between Project plan and vision and the success of ERP system implementation at level ($\alpha \geq 0.05$).**

To test this hypothesis the researcher uses the one sample T test to ensure the Impact of Project plan and vision in success of ERP system implementation. As shown in Table (4-15).

Table (4-15)

One sample T test results to test Impact of Project plan and vision in success of ERP system implementation

	N	Mean	Standard deviation	T Calculate	T Tabled	Degree of freedom	Sig*
Impact of Project plan and vision in success of ERP system implementation	100	4.135	0.524	21.629	1.980	99	0.000

* the Impact is significant at level ($\alpha \geq 0.05$)

Table (4-15) clarifies that there is a significant impact of Project plan and vision in success of ERP system implementation. The *T* Calculate was (21.629) at level ($\alpha \leq 0.05$) comparing with *T* Tabled was (1.980). And that Assuring unvalid first hypothesis. Unaccepted null hypotheses and accepted alternative hypotheses:

There is a significant relationship between Project plan and vision and the success of ERP system implementation at level ($\alpha \geq 0.05$).

HO1-2: There is no significant relationship between ERP System Selection and the success of ERP system implementation at level (α≥ 0.05).

To test this hypothesis the researcher uses the one sample T test to ensure the Impact of ERP System Selection in success of ERP system implementation. As shown in Table (4-16).

Table (4-16)

One sample T test results to test Impact of ERP System Selection in success of ERP system implementation

	N	Mean	Standard deviation	T Calculate	T Tabled	Degree of freedom	Sig*
Impact of ERP System Selection in success of ERP system implementation	100	3.870	0.514	16.915	1.980	99	0.000

* the Impact is significant at level (α ≥ 0.05)

Table (4-16) shows that there is significant impact of ERP System Selection in success of ERP system implementation. The *T* Calculate was (16.915) at level (α ≤ 0.05) comparing with *T* Tabled was (1.980). And that assuring unvalid second hypothesis. Unaccepted null hypotheses and accepted alternative hypotheses:

There is a significant relationship between ERP System Selection and the success of ERP system implementation at level (α ≥ 0.05).

HO1-3: There is no significant Impact of Top Management Support in success of ERP system implementation at level ($\alpha \leq 0.05$).

To test this hypothesis the researcher uses the one sample T test to ensure the Impact of Top Management Support in success of ERP system implementation. As shown in Table (4-17).

Table (4-17)

One sample T test results to test Impact of Top Management Support in success of ERP system implementation

	N	Mean	Standard deviation	T Calculate	T Tabled	Degree of freedom	Sig*
Impact of Top Management Support in success of ERP system implementation	100	4.012	0.527	19.199	1.980	99	0.000

* the Impact is significant at level ($\alpha \geq 0.05$)

Table (4-17) shows that there is a significant impact of Top Management Support in success of ERP system implementation. The *T* Calculate was (19.199) at level ($\alpha \leq 0.05$) comparing with *T* Tabled was (1.980). And, that assuring the unvalid third hypothesis. Unaccepted null hypotheses and accepted alternative hypotheses:

There is significant impact of Top Management Support in the success of ERP system implementation at level ($\alpha \geq 0.05$).

HO2: There is no significant relationship between Project factors (Project Management, Project Champion, Teamwork and Composition, Vendor Support) and the success of ERP system implementation at level ($\alpha \geq 0.05$).

To test this hypothesis the researcher uses the one sample T test to ensure the Impact of Project factors in the success of ERP system implementation as shown in Table (4-18).

Table (4-18)

One sample T test results to test Impact of Project factors in success of ERP system implementation

	N	Mean	Standard deviation	T Calculate	T Tabled	Degree of freedom	Sig*
Impact of Project factors in success of ERP system implementation	100	4.162	0.428	27.108	1.980	99	0.000

* the Impact is significant at level ($\alpha \geq 0.05$)

Table (4-18) shows that there is a significant impact of Project factors in the success of ERP system implementation. The *T* Calculate was (27.108) at level ($\alpha \leq 0.05$) comparing with *T* Tabled was (1.980). And, that assuring unvalid second main hypothesis. Unaccepted null hypotheses and accepted alternative hypotheses:

There is a significant relationship between Project factors and the success of ERP system implementation at level ($\alpha \geq 0.05$).

To ensure the impact of Project factors in success of ERP system implementation, the researcher divided the second main hypothesis to four subhypotheses, and used the One sample T test to test each subhypothesis as a following:

HO2-1: There is no significant relationship between Project Management and the success of ERP system implementation at level (α≥ 0.05).

To test this hypothesis, the researcher uses the one sample T test to ensure the Impact of Project Management in the success of ERP system implementation. As shown in Table (4-19).

Table (4-19)

One sample T test results to test Impact of Project Management in success of ERP system implementation

	N	Mean	Standard deviation	T Calculate	T Tabled	Degree of freedom	Sig*
Impact of Project Management in success of ERP system implementation	100	4.172	0.557	21.012	1.980	99	0.000

* the Impact is significant at level (α≥ 0.05)

Table (4-19) shows that there is a significant impact of Project Management in the success of ERP system implementation. The *T* Calculate was (21.012) at level (α ≤ 0.05) comparing with *T* Tabled was (1.980). And, that assuring the invalid first hypothesis. Unaccepted null hypotheses and accepted alternative hypotheses:

There is a significant relationship between Project Management and the success of ERP system implementation at level (α≥ 0.05).

HO2-2: There is no significant relationship between the presence of Project Champion and the success of ERP system implementation at level ($\alpha \geq 0.05$).

To test this hypothesis, the researcher uses the one sample T test to ensure the Impact of Project Champion in success of ERP system implementation as shown in Table (4-20).

Table (4-20)

One sample T test results to test Impact of Project Champion in success of ERP system implementation

	N	Mean	Standard deviation	T Calculate	T Tabled	Degree of freedom	Sig*
Impact of Project Champion in success of ERP system implementation	100	4.146	0.517	22.164	1.980	99	0.000

* the Impact is significant at level ($\alpha \geq 0.05$)

Table (4-20) shows that there is a significant impact of Project Champion in the success of ERP system implementation. The *T* Calculate was (22.164) at level ($\alpha \leq 0.05$) comparing with *T* Tabled was (1.980). And, that assuring invalid second hypothesis. Unaccepted null hypotheses and accepted alternative hypotheses:

There is a significant relationship between the presence of Project Champion and the success of ERP system implementation at level ($\alpha \geq 0.05$).

HO2-3: There is no significant relationship between the Teamwork and Composition and the success of ERP system implementation at level ($\alpha \geq 0.05$).

To test this hypothesis, the researcher uses the one sample T test to ensure the Impact of Teamwork and Composition in the success of ERP system implementation as shown in Table (4-21).

Table (4-21)

One sample T test results to test Impact of Teamwork and Composition in success of ERP system implementation

	N	Mean	Standard deviation	T Calculate	T Tabled	Degree of freedom	Sig*
Impact of Teamwork and Composition in success of ERP system implementation	100	4.210	0.519	23.278	1.980	99	0.000

* the Impact is significant at level ($\alpha \geq 0.05$)

Table (4-21) shows that there is significant impact of Teamwork and Composition in the success of ERP system implementation. The *T* Calculate was (23.278) at level ($\alpha \leq 0.05$) comparing with *T* Tabled was (1.980). And, that assuring invalid third hypothesis. Unaccepted null hypotheses and accepted alternative hypotheses:

There is a significant relationship between the Teamwork and Composition and the success of ERP system implementation at level ($\alpha \geq 0.05$).

HO2-4: There is no significant between Vendor Support and the success of ERP system implementation at level ($\alpha \geq 0.05$).

To test this hypothesis the researcher uses the one sample T test to ensure the Impact of Vendor Support in success of ERP system implementation. As shown in Table (4-22).

Table (4-22)

One sample T test results to test Impact of Vendor Support in success of ERP system implementation

	N	Mean	Standard deviation	T Calculate	T Tabled	Degree of freedom	Sig*
Impact of Vendor Support in success of ERP system implementation	100	4.120	0.514	21.788	1.980	99	0.000

* the Impact is significant at level ($\alpha \geq 0.05$)

Table (4-22) clarifies that there is significant impact of Vendor Support in the success of ERP system implementation. The *T* Calculate was (21.788) at level ($\alpha \leq 0.05$) comparing with *T* Tabled was (1.980). And, that assuring invalid fourth hypothesis. Unaccepted null hypotheses and accepted alternative hypotheses:

There is a significant relationship between Vendor Support and the success of ERP system implementation at level ($\alpha \geq 0.05$).

HO3: There is no significant relationship between Organizational factors (Business process re-engineering, communication, user training and education, Organizational Resistance) and the success of ERP system implementation at level (α≥ 0.05).

To test this hypothesis, the researcher uses the one sample T test to ensure the Impact of Organizational factors in success of ERP system implementation as shown in Table (4-23).

Table (4-23)

One sample T test results to test Impact of Organizational factors in success of ERP system implementation

	N	Mean	Standard deviation	T Calculate	T Tabled	Degree of freedom	Sig*
Impact of Organizational factors in success of ERP system implementation	100	3.618	0.505	12.230	1.980	99	0.000

* the Impact is significant at level (α≥ 0.05)

Table (4-23) clarifies that there is significant impact of Organizational factors in the success of ERP system implementation. The *T* Calculate was (12.230) at level (α ≤ 0.05) comparing with *T* Tabled was (1.980). And, that assuring invalid third main hypothesis. Unaccepted null hypotheses and accepted alternative hypotheses:

There is a significant relationship between Organizational factors and the success of ERP system implementation at level (α≥ 0.05).

To ensure the impact of Organizational factors in success of ERP system implementation, the researcher dividing the third main hypothesis to four subhypothesis, and uses the One sample T test to test each subhypothesis. As a following:

HO4-1: There is no significant relationship between Business process re-engineering and the success of ERP system implementation at level ($\alpha \geq 0.05$).

To test this hypothesis, the researcher uses the one sample T test to ensure the impact of Business process re-engineering in the success of ERP system implementation. As shown in Table (4-24).

Table (4-24)

One sample T test results to test Impact of Business process re-engineering in success of ERP system implementation

	N	Mean	Standard deviation	T Calculate	T Tabled	Degree of freedom	Sig*
Impact of Business process re-engineering in success of ERP system implementation	100	3.580	0.538	10.848	1.980	99	0.000

* the Impact is significant at level ($\alpha \geq 0.05$)

Table (4-24) clarifies that there is a significant impact of Business process re-engineering in success of ERP system implementation. The *T* Calculate was (10.848) at level ($\alpha \leq 0.05$) comparing with *T* Tabled was (1.980). And, that assuring invalid first hypothesis. Unaccepted null hypotheses and accepted alternative hypotheses:

There is a significant relationship between Business process re-engineering and the success of ERP system implementation at level ($\alpha \geq 0.05$).

HO4-2: There is no significant relationship between communication a the success of ERP system implementation at level (α≥ 0.05).

To test this hypothesis, the researcher uses the one sample T test to ensure the impact of Communication in the success of ERP system implementation as shown in Table (4-25).

Table (4-25)

One sample T test results to test Impact of Communication in success of ERP system implementation

	N	Mean	Standard deviation	T Calculate	T Tabled	Degree of freedom	Sig*
Impact of Communication in success of ERP system implementation	100	3.940	0.603	15.579	1.980	99	0.000

* the Impact is significant at level (α≥ 0.05)

Table (4-25) clarifies that there is significant impact of Communication in success of ERP system implementation. The *T* Calculate was (15.579) at level (α ≤ 0.05) comparing with *T* Tabled was (1.980). And, that assuring invalid second hypothesis. Unaccepted null hypotheses and accepted alternative hypotheses:

There is a significant relationship between Communication and the success of ERP system implementation at level (α≥0.05).

HO4-3: There is no significant relationship between User training and education and the success of ERP system implementation at level ($\alpha \geq 0.05$).

To test this hypothesis, the researcher uses the one sample T test to ensure the Impact of User training and education in success of ERP system implementation as shown in Table (4-26).

Table (4-26)

One sample T test results to test Impact of User training and education in success of ERP system implementation

	N	Mean	Standard deviation	T Calculate	T Tabled	Degree of freedom	Sig*
Impact of User training and education in success of ERP system implementation	100	4.048	0.560	18.713	1.980	99	0.000

* the Impact is significant at level ($\alpha \geq 0.05$)

Table (4-26) shows that there is a significant impact of User training and education in success of ERP system implementation. The *T* Calculate was (18.713) at level ($\alpha \leq 0.05$) comparing with *T* Tabled was (1.980). And, that assuring invalid third hypothesis. Unaccepted null hypotheses and accepted alternative hypotheses:

There is a significant relationship between User training and education and the success of ERP system implementation at level ($\alpha \geq 0.05$).

HO4-4: There is no significant relationship between Organizational Resistance Management and the success of ERP system implementation at level ($\alpha \geq 0.05$).

To test this hypothesis, the researcher uses the one sample T test to ensure the Impact of Organizational Resistance in the success of ERP system implementation as shown in Table (4-27).

Table (4-27)

One sample T test results to test Impact of Organizational Resistance Management in success of ERP system implementation

	N	Mean	Standard deviation	T Calculate	T Tabled	Degree of freedom	Sig*
Impact of Organizational Resistance Mang. in success of ERP system implementation	100	3.738	0.766	9.624	1.980	99	0.000

* the Impact is significant at level ($\alpha \geq 0.05$)

Table (4-27) clarifies that there is significant impact of Organizational Resistance Management in the success of ERP system implementation. The *T* Calculate was (9.624) at level ($\alpha \leq 0.05$) comparing with *T* Tabled was (1.980). And, that assuring invalid fourth hypothesis. Unaccepted null hypotheses and accepted alternative hypotheses:

There is a significant relationship between Organizational Resistance Management and the success of ERP system implementation at level ($\alpha \geq 0.05$).

For a deeper understanding for the impact of each factor on the ERP implementation success, a Multi-Regression analysis has been conducted and results are displayed in table (4-28)

Table (4-28)

Multi-Regression analysis test results to the impact of the study's factors on the success of ERP implementation

Independent Variables		(R)	(R2)	Adjusted (R2)	F Calculated	β	Sig*
Model 1	Managerial Factors	0.591	0.349	0.340	39.093	0.726	0.000
Model 1	Project Factors	0.497	0.247	0.236	23.905	0.621	0.000
Model 1	Organizational Factors	0.633	0.401	0.393	48.821	0.681	0.000
Model 2	Managerial Factors	0.621	0.386	0.369	22.651	0.560	0.000
	Project Factors					0.295	
Model 3	Managerial Factors	0.678	0.460	0.437	20.145	0.384	0.000
	Project Factors					0.017	
	Organizational Factors					0.456	

* the impact is significant at level ($\alpha \geq 0.05$)

From the results, we found that the highest R^2 value (0.460) was in model-3 means that the combination of the factors' categories has the greatest impact on ERP implementation success. However, Organizational Factors have the greatest R^2 value (0.401) among the three categories in Model-1 which means that it has the greatest impact on the success of ERP.

Chapter Five: *Results Discussion and Recommendations*

5.1. Results Discussion

5.2. Recommendations

5.1. Results Discussion:

In general, the obtained results were on line with previous studies findings which emphasize the criticality of the managerial, project and organizational factors whice have examined in this study. The consensus on these factors indicates their reliability and the possibility to build a less risky framework for ERP systems implementation accordingly.

- The statistical results show a significant relation between the studied managerial factors and the success of ERP systems implementation. The importance of these factors can be referred to two major reason:

    1- High cost

    2- Associated changes on both, operational and organizational level.

    Top management is the empowered party to dedicate the required resources and officially impose the change. Hence, their awareness, support and commitment are essential not only for embarking an ERP project but also for its survival and success.

    - In accordance with other studies like Nah et al., (2003) and Holland and Light (1999), Project Plan and Vision were found critical for ERP success in this study. Determining the budget prior embarking an ERP has recorded the highest mean which is normal in costly projects like ERP where success is tightly entwined with the flow of resources. From the other hand, setting a new organizational structure has the lowest mean which can be referred to culture of organization and to reduce the organizational resistance.

    - In accordance with studies like Davenport (1999) and Sumner (1999), System Selection has been found critical for ERP success this study. Carefully setting of the criteria to select the system based on has recorded the highest mean. System suitability for an organization depends on certain financial, operation and organizational elements. The more capable an organization was in translating these elements to criteria, the more relevant the selected system will be. whereas, the system being represented to the organization by vendor has the lowest mean. That is because organizations tend to analyze their needs and capabilities internally first before backing to vendors proposals.

    - Top management criticality in ERP project was detected by the majority of studies like Nah (2003), Brown and Vessey (2003), Holland and Light (1999), Umble et al., (2003) and so was the case in this study. The allocation of required resources has recorded the highest mean. This is

because ERP project survival greatly relies on the availability of both, financial and human resources. Any shortage in these resources will badly impact the implementation process if not terminating it.

- The statistical results show a significant relation between the studied project factors and the success of ERP systems implementation. A good project plan, qualified project management, the presence of high-level executive to lead the project, a good implementation team and employing capable consultants were all important for a better handling for the ERP implementation on a practical level, hence a better chance to success.

    - The project management found important for ERP implementation success which was in line with other studies like Nah (2003), Sumner (1999), Falkowski et. al., (1998) and Holland et al (1999). The knowledge and capabilities of project managers have recorded the highest mean. That's because ERP is a very sophisticated system that combines technical, managerial and inter-personal concepts. Good managers with multi-skills to deal with these concepts are strongly required to properly handle the implementation process.

    - The presence of a "Project Champion" has been found critical in other studies too like Folkowski et al (1999), Nah (2003) and Sumner (1999). Being from a High executive level has recorded the highest mean. The importance of this factor can be directly related to the importance of top management support in ERP project. A high-executive champion would influence top management decisions and enhance their support to the project.

    - The teamwork and its composition were also found critical in the majority of related studies. Being a mix of internal staff and consultants has recorded the highest mean. This is because deep knowledge in ERP systems is limited even for personals with IT-background. The presence of consultants in ERP project is very essential for a professional assistance in implementing the system from one hand and for transferring their knowledge to the internal staff from the other hand.

    - This study emphasizes the importance of vendor support ERP projects. Vendor participation in the implementation plan's architecting has recorded the highest mean. Due to their experience in ERP implementation and their deep/special knowledge in their systems, vendors' participation in setting the implementation plan will greatly increase its chances to success.

- The statistical results show a significant relation between the studied organizational factors and the success of ERP systems implementation. Adjusting some processes to fit ERP standards, a well communicating the system with employees, user training and a good resistance control were all found significant in ERP projects.

    - The majority of related studies have defined the Business Process Reengineering as a major critical factor in ERP success. Some of these studies are Holland et al., (1999), Samner (1999), Zhang et al., (2003) and Umble & Umble (2002). This is because ERP systems' applications have been developed based on best practices. In order for a company to streamline its processes and magnify the reaped benefits from the implemented system, organization should adhere these applications. The more organization stick to their poorly designed processes that considerably deviate from ERP standard processes the less improvement will gain from their ERP system.

    - Communicating ERP system with employees in terms importance, awareness and impact on their jobs was found important to prepare the employees for the change and reduce their resistance; hence, enhance the implementation process success. Studies like Falkowski et al. (1998), Holland et al., (1999), Sumner (1999) and Wee (2000), have all ended to the same result. However and despite the thought that ERP impact on employees' jobs would be the most important factor in this group for being the main cause for organizational resistance, awareness about the huge resources being allocated has recorded the highest mean. This can be referred to the importance of ERP projects for management from a financial wise the thing that has been reflected in their communication with the systems users. Indeed, communicating the magnitude of investments allocated in ERP projects would resemble its importance and enhance users to cooperate.

    - Users training (both, implementation team and employees) has found important to educate employees about the system, how to utilize it and how it will change their works was found important to increase their acceptance to the system and prepare them to use it hence participate in implementing it successfully. Among all clauses, the intensive training of internal staff that handles the implementation process has recorded the highest mean. This is because improving the internal implementation team would be a very good advantage for ERP project not only for next steps in the implementation processes but also to be as a reference, diffuse knowledge across the organization and train new employees.

- The control of organizational resistance was found important in ERP project. An organization can reduce employees' resistance to ERP by educating them about the system, the associating changes, involving them in designing the new processes and introducing them to its application before start using it officially. For instance, employees previewing to the system before start using it has recorded the highest mean. That's because ERP applications are mostly unknown for the majority of end users and the fear from using its complicated application can be a serious barrier in ERP projects. Thus, a prior and gradual introducing for the system as a assisting tools rather than extra work will enhance employees acceptance to the system and stimulate them to utilize it.

As a whole and from the Multi-Regression test, ERP projects have a greater chance to success when the all these factors considered and well managed. However, Organizational factors found to have the greatest impact on ERP implementation success over the other categories.

Despite the thought that top management plays, the major role in ERP implementation considering the huge resources and powerful support, organization factors ranked first. This result can be referred to core of ERP working mechanism which tends basically to standardize the existing processes to optimize the best business practices. Hence, even if the other factors have been delivered, organization will still unable to enjoy ERP benefits until re-engineering their existing processes to meet ERP’s standards.

Another reason might be the existing culture in organizations and relative stability in their processes especially in developing countries. These two factors magnify resistance to change even more which makes a serious obstacle even for managements with capabilities and willing to implement an ERP system.

2.5. Recommendations:

1- Organization should pay an exceptional attention to the budgeting issue in ERP projects. A profound feasibility study that accurately define all the one-time and ongoing cost compared to the reasonable benefits would likely gained from the system is critical to ensure that investing in an ERP system will be a wise decision and avoid any unexpected deficiencies during the implementation.

2- Despite the outstanding recorded benefits and fascinating success stories for many cases, organizations should always be reasonable in setting their expected benefits from an ERP system. Sometimes, ERP failure is not about a deficient delivery for its roles as a system, rather not meeting the high expectations of the implementing organization.

3- Top systems are not necessarily the best. On contrarily, top systems can be too advanced that makes it hard to be applied. Hence, organizations are highly recommended to focus more on their financial abilities, employees' capabilities, to how extend changes can be done and the applications they really need before selecting the system. Sometimes, simple ERP systems perform much more butter than advanced one especially for organizations with limited capabilities or in business sectors that don't required such an advanced technology.

4- Balance between official and unofficial ways is a key factor for ERP projects success. Encouragement and smooth communications on an inter-personal level side by side with mandatory training courses and official policies maximize employees' cooperation and grant a perfect environment for ERP projects success.

5- Project team and managers should be qualified in both, technical and managerial wise. Furthermore, it's recommended to employ personnel who are common with ERP systems' implementation. It's anticipated that such qualifications would enhance the team's performance and cut some training costs/time.

6- With the increasing number of ERP systems' vendors worldwide, organization should take the chosen system's vendor in consideration. ERP systems required a periodic maintenance and upgrading. A vendor who is technically capable to keep in track with latest technologies and modern applications yet offering a good after-implementation service in terms of maintenance, support, trouble shouting and training should has a priority.

ERP is a mean not a goal, a fact that organizations should completely aware about. Organizations should understand that ERP is a tool the more they utilize properly the more benefits they will gain.

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Appendix:

Appendix A: Questionnaire:

بسم الله الرحمـــن الرحيم

Middle East University for Graduate Studies

Faculty of Business Administration

Dear Madam/Sir,

This study, entitled "Critical Success Factors in ERP Implementation", is being prepared by the student Shatha Yousef a graduate student in Middle East University for Graduate Studies and under the supervision of Prof. Yaser Adwan in partial fulfillment of Master Degree in Business Administration. The study tends to address the factors affect the ERP systems implementation in Jordanian Industrial Organizations.

This questionnaire has been designed to collect the required data for this study. These data will be treated confidentially and used for academic purposes only.

Your assistance in answering these questions will be highly appreciated.

With all gratitudes ,,,

Researcher:

ShathaYousef

General Information:

1- Gender

☐ Male ☐ Female

2- Age

☐ *Less than 25 years* ☐ *From 26 to 35 years*

☐ *From 36 to 45 years* ☐ *More than 45 years*

3- Educational Level

☐ *High School* ☐ *Diplomat*

☐ *Bsc* ☐ *Master*

☐ *Phd* ☐ *Others*

4- Current Position

☐ *General Manager* ☐ *Departement Manager*

☐ *Unit Manager* ☐ *Employee*

5- Years of Experience

☐ *Less than 5 years* ☐ *From 5 to 10 years*

☐ *From 11 to 15 years* ☐ *More than 16 years*

ERP Success:

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Organization set a well designed plan that addressed the activities for implementing the system					
Organization has selected a relevant system					
Redesigned processes have been properly controlled					

Managerial Factors

1- Project Plan and Vision

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Organization has a clear vision about the ERP project and how it will impact its performance					
Organization determined the budget it's willing to allocate in ERP project.					
Organization addressed the possible risks associated with ERP project					
Organization addressed the desired and expected benefits from ERP business.					
A new organizational structure has been designed to fit the flow of activities					

2- ERP System Selection

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Organization carefully set the criteria which have been used to select the system					
Organization has carefully screened all the available systems					
Organization has back up of specialized consultants to help in the system selection					
The selected system was introduced /presented to organization by vendor					

3- Top Management Support

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Top management has allocated all the required resources for ERP implementation					
Top management has delegated implementation authority for project managers					
Top management has set official policies					
Top management was updated with the implementation process progress					
Top management interferes and correct the implementation process if needed					

Project Factors

1- Project Management

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Project managers had good technical experience					
Project managers had a good knowledge in business processes					
Project managers had a good attitudes and inter-personal skills					
Project managers communicated the project strategies with employees in a friendly way					
Project managers have set good strategies for ERP implementation					

2- Project Champion

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
ERP project was leading by a high level executive					
Project leader promoted the project in top management and get their support					
Project manager has been a model for employees working behavior					
Project manager was capable to motivate employees and enhance them to change					
Project leader strives to solve problems faced during implementation					

3- Teamwork and Composition

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The team members has carefully been selected					
The team members enjoyed business and technical knowledge					
The team member have been trained on system and related business processes					
The ERP project has been the top and only priority for the team.					
Business team work was a mix of consultants and internal staff					

4- Vendor Support

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Vendor participated in the implementation plan architecting (design)					
Vendor consultants have offered well designed and intensive training programs for end users					
Vendor was ready to solve and troubleshooting any technical or procedural problem during the implementation					
Vendor has a quick response to organization needs					
Vendor's support has continued even after implementing the system in terms of maintenance and upgrading the system					

Organizational Factors

1- Business Process Re-engineering

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Some business processes have been modified to fit the ERP applications					
Limited amendments have been done on the system					
Changes in organizational structure have been done smoothly					
Specialized consultations have been utilized successfully to change the existing processes					

2- Communication

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Employees were aware about the huge resources the organization has been allocated in ERP system					
Employees have been educated about the system benefits in business					
Employees were aware about the importance of the system for the organization					
Employees were aware about the organizational and structural changes will likely be associated with ERP system					
Organization has communicated the systems objectives with the employees and its impact on their jobs.					

3- User Training and Education

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Organization has provided all resources required for training					
Internal staff has been intensively trained on the system					
An organization-wide training program has been placed and all employees where involved					
Training program was handled by highly qualified consultants and trainers					
Training programs where properly and well designed for end-users.					

4- Organizational Resistance

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Employees were aware of the change and ready to deal with					
Employees were previewed with ERP utilization before start using it through training.					
Employees have been involved in the design of the new business processes and satisfied with it.					
Employees concerns have been seriously handled and answered by top management					
Employees were educated about the importance of ERP system and motivated to use it.					

Appendix B: Gartner's chart, 2005.