

FACTORS WHICH INFLUENCE THE IMPLEMENTATION PHASE OF

ENTERPRISE RESOURCE PLANING (ERP)

By

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A Thesis Study

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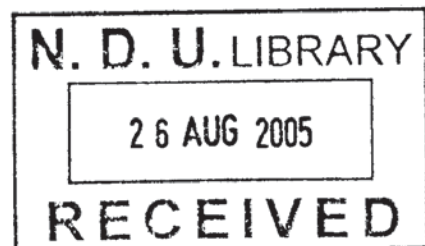
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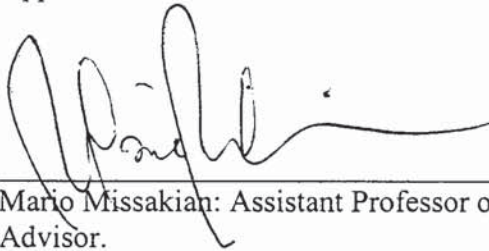


Factors Which Influence The Implementation Phase Of Enterprise Resource Planning
(ERP)

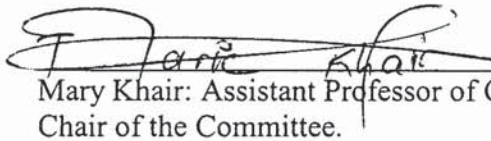
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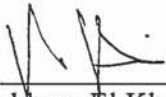
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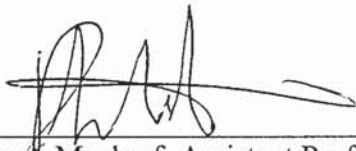
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"If you are going from A to B you do not always necessarily go in a straight line"

(Margaret Thatcher)

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Thank you!

ABSTRACT

Enterprise Resource Planning – ERP – is among the latest technologies that companies have undertaken. Typically it is a software package that has a centralized database for several modules; these modules could be customized based on the organization's needs. Since the cost of an ERP implementation is considered to be very high, it is critical for organizations to make it a success and start having return on their investment. But what makes an ERP implementation project successful? How to evaluate its success? These are the questions addressed by the thesis.

Answering these questions, a research on existing ERP implementation methods was conducted, analysis to the main findings was performed, and a new implementation model called the PDIA (Planning and preparation – Design – Implementation – Audit and fine tuning) model was introduced. A detailed focus on the steps of data conversion was accomplished. Identification of the critical success factors for the PDIA were recognized, and an evaluation model to evaluate them was done. The PDIA model was applied to a real ERP module at a retail company in Lebanon, and a simulation to the data conversion was achieved. When the implementation was over an evaluation for the implementation was completed. Finally a comparison to an implemented module within the firm was carried out, and a comparison to an implemented ERP at another retail company in Lebanon was studied to ensure the success of the introduced PDIA model.

TABLE OF CONTENTS

LIST OF FIGURES.....	IV
LIST OF TABLES.....	V
LIST OF ABBREVIATIONS	VI
CHAPTER 1: INTRODUCTION AND PROBLEM DEFINITION.....	1
1.1 INTRODUCTION TO THE GENERAL PROBLEM	1
1.2 PROBLEM DEFINITION.....	1
1.3 RESEARCH OBJECTIVES.....	2
1.4 RESEARCH APPROACH	3
1.4.1 Scope	3
1.4.2 Assumptions	4
1.4.3 Methodology	5
1.5 THESIS ORGANIZATION	6
CHAPTER 2: BACKGROUND AND MOTIVATION.....	7
2.1 BASIC ENTERPRISE RESOURCE PLANNING – ERP-CONCEPTS.....	7
2.1.1 What is ERP?	7
2.1.2 Objectives of ERP	10
2.1.3 Characteristics of ERP	10
2.1.4 Limitations of ERP	14
2.1.5 Risks in ERP projects.....	18
2.1.6 ERP main vendors.....	19
2.1.6.1 International ERP solution vendors.....	19
2.1.6.2 Local ERP solution vendors.....	25
2.1.7 ERP in Lebanon	28

2.2	DESCRIPTION OF IMPLEMENTATION AND EVALUATION METHODS	29
2.2.1	<i>Successful ERP implementation methods</i>	29
2.2.1.1	ERP implementation key success factors.....	29
2.2.1.2	Vendors implementation approach	30
2.2.1.3	Consultancy companies' implementation approach.....	33
2.2.2	<i>Standard evaluation methods for ERP implementation</i>	37
2.3	PREVIOUS WORK IN ERP IMPLEMENTATION METHODS	38
2.3.1	<i>Existing ERP implementation methods</i>	38
2.4	RESEARCH MOTIVATION	44
2.4.1	<i>Identified weaknesses in previous ERP implementation methods</i>	44
2.4.2	<i>Project justification</i>	44
CHAPTER 3: ORIGINAL WORK		46
3.1	ANALYSIS OF ERP IMPLEMENTATION PHASE.....	46
3.1.1	<i>The model parts</i>	46
3.1.2	<i>The tasks</i>	47
3.1.3	<i>The task's matrix</i>	53
3.2	FACTORS THAT INFLUENCE ERP IMPLEMENTATION	58
3.2.1	<i>The critical success factors - CSF</i>	58
3.3	ERP IMPLEMENTATION METHOD EVALUATION MODEL	61
3.3.1	<i>The evaluation</i>	61
3.3.2	<i>The PDIA evaluation model</i>	61
3.4	DATA CONVERSION.....	72
3.4.1	<i>Data conversion overview</i>	72
3.4.2	<i>The challenges of data conversion in ERP implementation</i>	73
3.4.3	<i>Data conversion steps</i>	75

CHAPTER 4: PRACTICAL CASE STUDY	79
4.1 ERP MERCHANDISE PLANNING MODULE IMPLEMENTATION AT A LEBANESE RETAIL COMPANY	79
4.1.1 <i>About the company</i>	79
4.1.2 <i>About the module</i>	80
4.1.3 <i>MP implementation</i>	82
4.1.4 <i>MP evaluation</i>	87
4.1.5 <i>Comparison to other ERP modules within the firm and with other firm</i>	96
4.1.5.1 Module within the firm	96
4.1.5.2 Module within another firm	97
4.1.5.3 Comparison between modules implementation.....	100
CHAPTER 5: CONCLUSIONS	102
5.1 SUMMARY OF THE MAIN RESULTS.....	102
5.2 GENERALIZABILITY OF THE THESIS	103
5.3 MAIN CONTRIBUTIONS OF THE THESIS.....	103
5.4 POSSIBLE EXTENSIONS AND FUTURE WORK.....	104
REFERENCES	105
APPENDIX	109

LIST OF FIGURES

Figure 1: ERP concept	8
Figure 2: Bisentro implementation methodology	40
Figure 3: The PDIA Model	47
Figure 4: Distribution of the weight on the PDIA parts.....	64
Figure 5: Merchandise Planning Process.....	81
Figure 6: Arthur Interface	82
Figure 7: Major MP PDIA plan	83
Figure 8: Detailed MP PDIA plan	83
Figure 9: Old system data	85
Figure 10: Data converted to new system.....	86
Figure 11: Log table fields.....	87
Figure 12: Top management, project sponsor, and steering committee commitment and support for MP	88
Figure 13: Change management culture and program for MP	89
Figure 14: Effective communication for MP	90
Figure 15: Pertinence of training to technical team for MP.....	93
Figure 16: Distribution of workload for MP	93
Figure 17: DPIA evaluation for MP.....	95
Figure 18: PDIA evaluation for MP parts.....	95

LIST OF TABLES

Table 1: ERP functionalities	8
Table 2: ERP characteristics	11
Table 3: ERP limitations.....	14
Table 4: PDIA task matrix for the planning and preparation part	54
Table 5: PDIA task matrix for the design part.....	55
Table 6: PDIA task matrix for the implementation part	56
Table 7: PDIA task matrix for the audit and fine tuning part	56
Table 8: PDIA task matrix for the audit project performance measure	57
Table 9: Frequency, weight, and PDIA part for each critical success factor.....	63
Table 10: Weight of each PDIA part with number of critical success factors in each part	63
Table 11: Adapted data conversion steps.....	76
Table 12: MP implementation scoring using PDIA model.....	88
Table 13: Comparison between modules.....	101

LIST OF ABBREVIATIONS

- ASAP: Accelerated SAP
- BPR: Business Process Re-Engineering
- CRM: Customer Relationship Management
- CSF: Critical Success Factor
- ERP: Enterprise Resource Planning
- GMROI: Gross Margin Return On Investment
- HR: Human Resources
- IT: Information Technology
- MMS: Merchandise Management System
- MP: Merchandise Planning
- OSS: Online Service System
- OTB: Open To Buy
- PDIA: **P**lanning & preparation, **D**esign, **I**mplementation, and **A**udit and fine tuning
- POS: Point of Sale
- PPM: Project Phase Model
- RDBMS: Relational Database Management System
- ROI: Return On Investment
- R&D: Research and Development
- SAP: System Application Product

CHAPTER 1: INTRODUCTION AND PROBLEM DEFINITION

1.1 INTRODUCTION TO THE GENERAL PROBLEM

In general, much literature exists on the nature of Enterprise Resource Planning systems known as ERP systems and their adoption by business around the world [15]. Case studies have been presented and generalizations drawn from their outcomes, however, due to the relative newness of ERP on a global scale, no widely adopted methodologies for their implementation and use yet exist [11]. Nor are there clear results on how widely enterprise technologies have been assimilated by the users within organizations¹ [15]

1.2 PROBLEM DEFINITION

Implementing an ERP system is an expensive undertaking for any business (in terms of cost and time) [5] and therefore studies of this area are widely applicable given the current popularity of such systems. Difficulties during implementation arise from the cultural and functional differences of every business environment; therefore a focus will be taken on various aspects within one organization.

Depending on which report read 60 - 90% of ERP software projects are considered failures [33]. So how do you avoid becoming part of this disturbing statistics? Typical problems include implementation delays, cost overruns, and performance problems after

¹ Please note that the words organization, firm, and company will be used interchangeably in the thesis

implementation. No standard implementation process for implementing different ERP systems exists.

Since the cost of an ERP implementation is considered to be very high, it is critical for organizations to make it a success, and start having return on their investment. But what are the factors that influence an ERP implementation project? How to evaluate its success?

1.3 RESEARCH OBJECTIVES

This paper addresses ERP systems implementation methods, which are mostly developed by ERP vendors and ERP consulting firms to support the implementation of ERP systems. The interest in ERP systems implementation methods originates in particular, from the large-scale adoption of ERP systems during the past decade ([6], [14]). Research on ERP systems has so far been mainly focused on success or failure of implementation and impact issues [10]. Less attention has been given to the methods used during the configuration and the implementation of ERP systems [9], even though they are commonly used in practice, they remain un-explored. The main contribution of this research is a different sequence or various steps during the implementation of ERP systems.

This research will be significant, as it will highlight major issues in implementing any ERP package, issues which must be considered as the world moves towards more global systems [5]. ERP packages are significantly more complex and a case must be made to

prove or disprove the successful implementation factors. Additionally, a witness to the different stages of implementation of an ERP application is done to justify the findings.

The overall purpose of this study is to investigate the factors that influence the Enterprise Resource Planning (ERP) implementation, and implement an ERP module at a Retail company in Lebanon, and finally to evaluate the implementation.

1.4 RESEARCH APPROACH

1.4.1 Scope

An ERP study is highly desirable for businesses, as tips and caveats identified may benefit future organizations undertaking ERP implementation as financial benefits such as cost savings may be identified [5].

There is a lack of systematic research into the development and implementation of ERP systems in general. Research into the implementation process of an ERP has been very limited. This lack of published research into ERP implementation is being addressed with recent conference and journal calls for practical ERP implementation articles and submissions.

During the past few years the academic interest towards Enterprise Resource Planning (ERP) has increased notably. Since Davenport introduced the topic of ERP to the academic community the number of academic publications, has increased steadily [5].

The significance of the research findings of this dissertation lies in the benefit of the results to both researchers and practitioners in this field. The identification of factors which influence implementation phase of ERP, will ensure that future research in this area will be able to plan for these factors and avoid problems with the implementation.

It is of great importance to make limitations, which means to define what is the scope of the research. These limitations are ultimately aimed at improving the efficiency and the quality of the study.

The research will propose a new ERP implementation model, without going into the details of its tasks. It will identify the factors that influence an ERP system implementation. It will not cover the phases that proceed or follow the implementation phase. Moreover, it will focus on one technical aspect of the ERP implementation model which is the data conversion. The reason for this is to be able to go a bit more into depth instead of just providing a broader scope of the whole area. After all, the time frame of the research for the Master's Thesis is limited to two semesters.

After the identification of the factors an evaluation model will be proposed, and its details that are open to discussions and complex analysis are good consideration for project extension.

1.4.2 Assumptions

It is assumed that:

- The readers of this paper have basic knowledge about the Enterprise Resource Planning systems
- The software selected for the practical ERP module implementation is the appropriate one and the hardware used is compatible with it
- Other assumptions will be indicated in their corresponding sections

1.4.3 Methodology

The research conducted consists of a theoretical part and a practical part. The theoretical part of this study explores the ERP system implementation from the company's project management point of view. The reason for this is that the trend in the ERP software market, as well as in the software markets in general, has been increasingly from individually tailored software applications towards standardized packaged software. Thus, it can be argued that the client's viewpoint is necessary in order to comprehend all the important aspects of ERP implementation.

Further, as a part of the theoretical part of this study, a preliminary research as part of the research process is carried out in the form of a pilot study in order to gain a general level understanding of the ERP implementation process. The reason for this is that comprehensive prior research on the topic was lacking and further, the personal experience on ERP implementation was limited. The preliminary research was conducted in the form of a study to investigate the process and criteria that influence ERP implementation.

A detailed analysis was conducted to identify the factors that influence ERP implementation. The goal of the empirical part of the study, then, is to examine the identified factors and implement an ERP module at a Retail company in Lebanon using the identified factors, as a part of the practical part of this study.

Finally, to complete the practical part, an evaluation of the implemented module will be conducted. Moreover, a comparison to similar implemented modules within the firm will be carried out, to ensure the success of the identified steps. In addition, a comparison to another company who has implemented an ERP system in Lebanon will be conducted.

1.5 THESIS ORGANIZATION

The thesis is divided into five chapters. Chapter 2 deals with the background of the project and the causes that motivated its implementation. Chapter 3 includes the design of an efficient ERP implementation, and implementation evaluation process, with a focus on one technical aspect the data conversion. Chapter 4 presents a practical case study, the implementation of an ERP module at a Lebanese retail company, evaluates this implementation, compares it to other implemented modules within the firm and at last compares it to another implemented ERP system in Lebanon. Finally chapter 5 sizes a conclusion, generalization, and proposes any possible future work for the thesis.

CHAPTER 2: BACKGROUND AND MOTIVATION

2.1 BASIC ENTERPRISE RESOURCE PLANNING – ERP-CONCEPTS

2.1.1 *What is ERP?*

ERP has been defined as the integrated software suite that has propelled the software industry to greater success, and helped to sustain it, following the dot-com burst. It has been one of the success stories of the IT industry in recent years. Widely regarded as one of the most innovative developments in the IT industry in the 1990s, ERP is rapidly becoming a widespread IT solution in organizations as they move from functional to process-based infrastructure [13].

The growth of ERP was initially fuelled by the changes that had to put in place in the run up to the year 2000 known as “Y2K”. Preparations required handling the Euro also contributed to the continued growth. With the Y2K and the Euro, focus began to shift to the increasing interest in e-business, knowledge management, customer relationship management, etc, as strategies for competitive advantage. These became hugely promoted by vendor promises aided by media type. Organizations were increasingly being convinced that in order to enjoy the full benefits of technologies and strategies they must link their applications and open them up to all those that need access to them either on the Internet or on corporate Intranets [6].

ERP systems are comprehensive packaged software solutions that aim for all business processes and functions total integration. ERP provide a common integrated software platform for business processes [20]. Enterprise Resource Planning –ERP- is among the latest technologies that companies have undertaken. Typically it is a software package that has a centralized database for several modules; these modules could be customized based on organization needs [26]. Figure 1 shows the ERP concept. Most ERP applications handle global operations such as multiple languages and currencies.

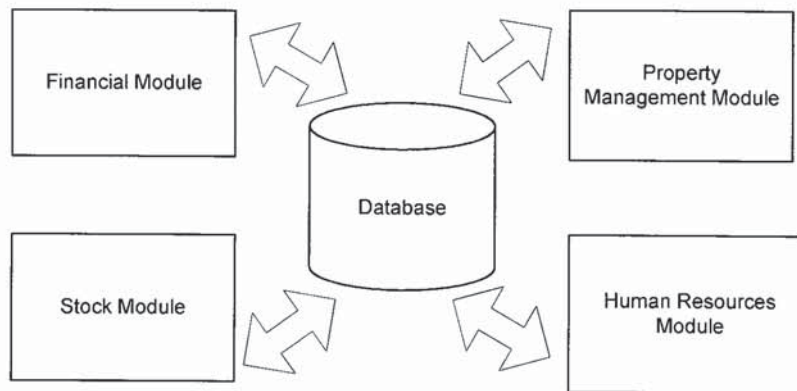


Figure 1: ERP concept

Davenport [6] defines ERP systems as packages of computer applications that support many, even most, aspects of an organization’s information needs. Table 1 shows the main functionalities of ERP.

Function	Description
Organization connection	Organization connection, internally and externally
Better information	Faster information processing
Monitoring	Real time monitoring
Global information	Information from around the globe
Seamless information flow	Information is transparent

Table 1: ERP functionalities

They enable organizations to become more connected – one business function with another, one business unit with another, or one company to another. They enable the yield of more and better information more quickly than they have been ever known to. They give managers the ability to monitor the goings-on in the company in near real time, without having to wait for monthly reports that must be cross-referenced with other monthly reports, all of which may be out of date by the time managers receive them. They enable managers to sit in front of their workstations and know what is happening at every point around the globe. They enable information to flow seamlessly across diverse business functions, business units, and geographic boundaries [6].

ERP has been defined as an integrated suite of application software modules, providing operational, managerial and strategic information for enterprises to improve productivity, quality, and competitiveness [26].

ERP systems are now widely seen as the backbone to enterprise-wide application integration in the modern economy. They are increasingly being relied upon by organizations for the processing of all their management information, to survive and stay in business, as well as gain and/or retain competitive advantage. The implementation of an ERP system is not an easy task. Successfully implementing an ERP can result in a considerable improvement in company and employee efficiency, with some recent industry reports suggesting as much as a 25 percent increase [4]. Nevertheless, successfully implementing an ERP often requires, in addition to purchasing the software itself, extensive customization to configure it to the specific client [2]. This customization

is critical because when it is not done properly the result can be expensive failure that may take a long time to correct and may even entail extensive loss, as happened with Hershey [27].

2.1.2 Objectives of ERP

The main objectives for ERP that were identified:

- ERP streamlines a company's data flows and provides management with a direct access to a wealth of information [5], which are transformed to benefits in productivity and speed, that assist the company to gain competitive advantage
- ERP provide the best practice functionality within departments and high level of integration across all enterprise functions, thus reduces the maintenance costs
- ERP bridge gap in value chain, the sequence of all process within or between organizations that adds value to the product or service

2.1.3 Characteristics of ERP

ERP systems are rich in terms of functionality and the main identified characteristics for ERP systems [8] are summarized in table 2:

Characteristic	Description
Modular construction	Several modules integrated in one system
Client-server architecture	Based on client-server architecture, with the introduction of the internet. It could be distributed
Extensive configuration	Customizable configuration based on organization's needs
Common central database	Up to date centralized database

Characteristic	Description
Variable interfaces and global business operations	Localized to the country law, language, currency, etc.
Business process re-engineering	Analyzing and restructuring of all business processes
Integrity	Integration of multiple related tasks
Resource allocation	Resources, time and cost definition
Extended	Extends the chain between supplier, organization, and clients

Table 2: ERP characteristics

A brief description of the characteristics:

- **Modular construction:** An ERP system consists of many different modules that together support most of the information-needs of a company, or that any organization may require with different modules covering different functions in the company. There are modules for financial accounting, production planning, human resources management, etc. Companies can choose what modules to implement, the more modules – the higher integration benefits from the system but also more complex implementation and greater need for business changes. The modules work in real time with online and batch processing capabilities. The fact that an ERP system can cover so many areas and needs may result in a situation where, apart from personal productivity applications (like the Microsoft Office software package), highly specialized production systems and Internet-based systems for information and knowledge access, an ERP system could be the

only information system and organization requires. Davenport [6] argues that this is a characteristic that distinguishes ERP systems from earlier systems.

- Client-server architecture: Today, ERP systems are commonly based on client-server architecture. This architecture means that most of the processing is done on a central server and only limited amounts on local clients (such as an ordinary PC). This can be seen in contrast to the old mainframe systems where all the processing was done centrally on the mainframe. The latest development in this area is using the Internet (or Internet technology) to access the server through a web browser interface on the client side. In addition it could be distributed.
- Extensive configuration: An ERP system is basically a standard set of applications. The set can be tailored to suit individual companies and their specific business environment through an extensive configuration. The ERP systems contain large configuration tables where the company uses mode switches to set, for instance, what kind of inventory accounting that shall be used? how product revenues are recognized and much more? The system can therefore be customized without any programming by using available switch settings. The configuration point is of much consideration to many companies, as it imposes a single way of how things shall be done throughout the whole company. Whatever actual configuration the company finally pursues, it has to be one that has a good fit with the company in order to be successful in the long run. Most ERP vendors have therefore developed templates for different processes and industries, which constitute a predefined set of answers to the many questions that used to “bedevil” a company when configuring a system to its processes. A company can as a result

drastically shorten the process of configuring a system if it is willing to use such a pre-configured template. This can lead to an easier implementation at the price of less flexibility. The risk with templates is that companies settle for a poor fit between their ERP system and the way they do business; hence they might lose a better and more competitive way of performing a key business process.

- Common central database: The ERP system has a common central database that can be accessed and kept up-to-date by all implemented modules. The database can for reasons of performance, risk management, and other, be mirrored to more physical servers than only one.
- Variable interfaces and global business operations: The ERP systems can be localized in different languages and handle multiple currencies. This makes the ERP system usable in different countries, when the user in one country can interact with the system in his or her native language and print documents with amounts expressed in the correct currency. Furthermore, the ERP system can also be adapted to, for instance, include nation-specific employment laws in its human resource module. ERP systems are therefore multinational in their very nature.
- Business process re-engineering – BPR: it is recommended by most practitioners to restructure all business processes as much as possible, by performing extensive analysis.
- Integrity: ERP integrates multiple related tasks to simplify the procedure.
- Resource allocation: ERP has a well-defined scope in terms of time, resources, and cost. Achieves economies of scale.

- Extended: ERP solution complete the chain between the supplier of the ERP, the firm which installed the ERP, and the customers of this firm.

2.1.4 Limitations of ERP

ERP has lots of advantages, but there are some weaknesses. ERP are heavy solution to install, which requires lots of resources to the enterprise, but also external resources such as technical and functional consultants, ERP suppliers, and sub-contractors. This task requires focusing efforts for several months on the same domain; in addition it requires operational experts coming from different sectors ([15], [17]). Main ERP constraints can be summarized into the following five types of limitations as shown in table 3.

Limitation	Description
Technical	Technical limitations in the system standardization, configuration, and functionalities
Organizational and Human Resources	Negative impact on the work, business process re-engineering, conflicts, and resistance to change
Strategic	Adaptation of the ERP to the organization needs
Financial	Consultants, new infrastructure, licenses, modifications, maintenance, continuous training, and others
Time	Long term return on investment, and adaptation to the system

Table 3: ERP limitations

- Technical limitations: They are sub-divided into three main parts:

- Standard system: ERP systems are standard products, which might have conflicts with different needs, strategies, and proper processes which are proper to the firm [17]
- Configuration: There might be customization or development limitations, and modifications to system configuration. This requires a long relation between the system developer of the ERP and the company [17]. The system developer faces some complexities while configuring the system, below is a list of some:
 - Obtaining the correct information by the developer to configure correctly is a difficult task
 - Consistency and comprehension of all configuration parameters by the developer is considered a tough task
 - Knowing the required details for customization is the most difficult task
- Functionalities: some functionalities might not be covered by the ERP [17], they are separated as follows:
 - Integration and optimization of functionalities with external partners: it represents all the supply chain management (SCM)
 - Integration and optimization of functionalities with clients: this covers all the customer relationship management (CRM)
- Organizational and Human Resources limitations: ERP can have a negative impact on the work practices and culture of an organization [25]

- Business process re-engineering for the enterprise: ERP is a system that goes into the enterprise functions. Consequently, each enterprise should modify its existing procedures, organizational charts, and job descriptions to work properly with the ERP [17]
- Conflicts: management should raise the sense of responsibility, motivation and need to change between the company staff, otherwise different types of operational conflicts [17] might rise:
 - Operational mode conflicts: it is related to the definition and manner of executing the tasks
 - Competency conflicts: implementing an ERP creates new job vacancies while neglecting some of the existing ones, and this might create conflicts between the new employees with the existing ones
 - Influence conflicts: implementing an ERP system causes to change the new flow of information, and removes the centralization of information with specific persons, and since the access to some information is considered as power, this might create conflicts between the employees
- Resistance to change: ERP impacts the methods and habits of work for employees used to be performed in an organization. “In general, there is a tendency to resist any change done for any thing” [7]. The internal communication must be encouraged at the beginning of the project, to

have transparency during the project. Intensive training should also be done for the users to make them more familiar with the system [1].

- Strategic limitations: Usually ERP systems should be adapted to the company's needs, while in most cases it is the opposite [7], which leads to:
 - Not taking into consideration the quantifiable data which should be taken into consideration in the decisions taken
 - Companies become dependant from the system and those who have implemented it
- Financial limitations: ERP systems cost is so huge for investment. Other elements affect the budget of an ERP [28]:
 - Engagement with expert consultants (technical or functional) costs an important amount of money, for example if a study is conducted by consultants from Price Waterhouse Coopers or from Deloitte & Touche, for a global study and necessary recommendations for the enterprise to perform better, it will cost between 180,000 and 250,000 USD
 - Installation of new infrastructure technology which sophisticates the budget, such as servers, software, networks, additional computers, operating systems, etc.
 - Licenses of the system which increase the cost considerably, for example for local suppliers license per user is between 500-600 USD, while for foreign suppliers it is between 800 and 1000 USD
 - Modifications or creation of new procedures recommended by the enterprise raises the costs for example the modifications required at the

Retail company in Lebanon to adopt the ERP to its business needs cost about 500,000 USD

- Maintenance for the ERP system can not always be anticipated within the budget
- Continuous training accompanying the implementation of the system should be taken into consideration in the budget
- Other supplementary costs either justified or not should also be considered such as: additional licenses, additional modules, technical problems, etc...
- Time limitations: ERP takes long time before the benefits of the system start to be seen [7]. Time might be delayed due to limitations as the ones mentioned above. Another time limitation is the adaptation to the system.

2.1.5 Risks in ERP projects

The risk is a difference in performance in terms of cost, quality, or time [17]. The risks for an ERP implementation project are the same risks of any project, like technical, financial, human, organizational, and commercial. At every phase of the ERP implementation there are risks. These risks are mainly divided into two groups:

- Internal risks: these are the risks that come from within the company they are mainly divided into sub-groups:
 - Technical: risks in the infrastructure of the system
 - Resources: risks in the availability of qualified resources in the project team
 - Project management: risks in the project management of the whole project

- Organizational and human: risks in the procedures, communication, and resources
- Budget: risks in not finishing the project within the set budget
- Time: risks in not completing on time
- External risks: these are the risks that come from outside the environment of the firm, and are mainly divided into sub-groups:
 - Politico-economic: risks in new laws for the country
 - Geographical: risks in case of natural disaster
 - Supplier: risks at the supplier side either functional or technical

2.1.6 *ERP main vendors*

2.1.6.1 International ERP solution vendors

According to a research done by AMR, leader in analysis of enterprise software, found that the market of ERP is facing an important growth rate. According to a study done in the USA and Canada done on 500 medium to large companies, 74% of these companies have or are in progress of implementation of ERP systems [23]. ERP turnover in 2003 reached \$20.6 billion, while it was \$20 billion in 2002, 65% of this increase is explained by maintenance and professional services fees. Prevision of growth for 2007 is around 6 to 7 % [24]. Growth is due to introduction of ERP to new sectors such as government.

Hundreds of ERP products exist with varying number of modules. However, the ERP market was dominated by 5 companies in early 2004, which generated about 64% of the total market revenues.

Note that the information might have been changed with the passed time.

- **SAP:** System Application Product in Data Processing is the literature explanation of SAP, it is a German company founded in 1972. It is the first company, which started to sell integrated software; it is the leader of the market of ERP from 4 years. Its products are distributed all the around the world on approximately all the industrial sectors (chemical, gas, construction, etc...). It counts for 28,900 employees and is present in 50 countries. It covers 19,300 companies ranging from medium to large size organizations. Totaling a 60,100 installation of SAP [39].

- **Partnership and products:** 15 years ago, SAP established a partnership with HP. Most of its installations are based on HP infrastructure. MYSAP ERP covers mainly the industrial sector, 43% of industries [23]. Main modules are: production, finance, HR, sales, logistics, property management, and after sales maintenance. Its products are adequate with business intelligence technology and Microsoft .Net [22]. MYSAP ERP allows easily the deployment of any SAP solution for example MYSAP CRM to the original or initial database. This approach allows the clients of SAP to update their management needs quickly with less cost.

- **Market:** currently the firm is targeting different type and size of companies by re-enforcing its sales force, and Research and Development (R&D) [39].

- **ORACLE:** founded in 1977, in California U.S.A. Oracle knew how to position itself on the market as the second supplier of integrated database for a better management of companies, known as RDBMS Relational Database Management Systems. It is also active in the market of server applications with maintenance and consultancy [37].
 - **Product:** E-Business Suite is a complete solution from oracle for operational and functional needs mainly in the activities of distribution in small and medium enterprises. It is a complete and integrated solution including:
 - Internal management of the company (finance, logistics, HR, cash management, property management, project management, stock and sales management
 - Supply chain management (SCM)
 - Customer relationship management (CRM)

It is a high quality product that meliorates the visibility, control, and efficiency of the company through its centralized system. On the other hand, applications are compatible with AIX server, Windows NT, UNIX, or Oracle.

- **Market:** most of its revenues are from the financial module. Recently they have acquired PeopleSoft; this acquisition will facilitate the job of facing SAP the number one in the ERP [34].

Remark: Oracle has universities that provide oracle certificates to its students [37].

- **PEOPLESOFT:** founded in 1987, on traditional client/server architecture, PeopleSoft continued to be in permanent innovation in terms of technology and development. It accounts for 11,000 clients in more than 150 countries [38].

Remarkable innovations:

- In 1988 PeopleSoft introduced an HR module
- In 1994 distribution and finance modules are dedicated to the public sector
- In 1996 PeopleSoft created version 6 and a production module
- In 1997 PeopleSoft 7 is an adequate version with industrial needs, enhanced at the end of the year with version 7.5
- In 2000 PeopleSoft announced the creation of PeopleSoft 8, which introduced the real-time enterprise with an internet platform, and a flexible and open configuration
- In parallel, it developed a CRM application which has been selected between the first 15 applications during 2000
- In order to increase its revenues in 2002, PeopleSoft re-enforced its sales force and its technical skills. The company was selected the

“Hottest Company 2002” by Start Magazine for being the pioneer of SCM

- **Market and acquisition:** PeopleSoft is mainly the leader in HR and financial modules; it after the acquisition of JD-Edwards in 2003 for 1.7 billion [41] USD became the number 3 of ERP suppliers.
- **Products:** following to the technical and functional synergy with JD-Edwards, PeopleSoft maintained its 3 family of products that can be integrated with its CRM and SCM [38]:
 - PeopleSoft Enterprise known under version PeopleSoft 8.X, it needs a pure Internet infrastructure. It is useful for industry, finance, government, health, and education
 - PeopleSoft Enterprise1 known by JD-Edwards5, requires an Internet infrastructure, it is easy to implement. System is dedicated for distribution, stock management, and property management
 - PeopleSoft World requires an IBM I-series infrastructure with the possibility of expansion to the Internet. This application is constituted of a simple database for small companies
- **JD-EDWARDS:** initials of the three creators Jack Thomson, Daniel Gregory, and Edwards Macveny. It was created in March 1977, in Denver Colorado, in order to meet the needs of mines. It is mainly present in distribution and petroleum industry. It covers more than 110 countries with a total of 6,600 employees. At the end of 2003, JD-Edwards counted for 4,700 clients [36].

- **Products:** before its acquisition by PeopleSoft, its main products were:
 - WorldSoftware: it is the first product of JD-Edwards created in 1977, under IBM AS/400. It offers a solution for production, logistics, commercial, accounting, and finance. It allows distribution of objects and data on the network in real time, in order to increase the system performance
 - OneWorld: developed in 1996, targeted for small and medium companies. OneWorld is a version of WorldSoftware. It offers approximately the same functionalities but with more optimization. This application requires a main IBM server and computers with transparent Windows 2000, while its database requires another SQL server
 - JD-Edwards developed the SMALL BUSINESS SOLUTIONS which targets the small companies

- **GEAC:** GEAC Enterprise Solutions is the first division of one of the most big computer companies GEAC Computer Corporation, with a 3% of market share, this Canadian supplier is powered of its turnover. After 33 years of experience in development and maintenance of integrated systems, GEAC is installed in more than 18,000 enterprises located in 55 countries [35].
 - **Products:** GEAC products are easy to implement, its product STREAMLINE proved its efficiency on the market. It is based on the client/server architecture, and installed on servers from its partner IBM,

IBM NetFinity and using Microsoft SQL as a server for the Database. It is not only dedicated for industries, distribution, and logistics, but also for government applications, property management, restaurant, and construction.

- **Merger:** during February 2003 required EXTENSIT Inc. supplier leader in employee relationship management, it is an application for HR management accessible for employees. It allows all the users to update their information; data exchange can be realized through a web interface and stored in the HR database, for example an employee can update his/her bank, address, or information when it changes [35].
- **Market:** GEAC Enterprise Solutions provides applications adapted in business intelligence, finance, HR, and logistics. It is mainly involved in financial applications (for example planning, ratios, budget, and consolidation) [35].

2.1.6.2 Local ERP solution vendors

Even if international ERP are expanded in the local market, there is an important number of Lebanese companies who installed high quality local ERP. Unfortunately in Lebanon there is no company specialized in ERP market analysis, however, there is an important number of ERP software created in Lebanon. Among these companies are the identified two companies which were contacted: Software Design and Computec

- **Software Design Consulting Group:** A Lebanese company founded in 1985, accounts for 52 employees. Through its consultants, it provides efficient

management consulting services for small and medium companies, for best ERP implementation. Software Design, proved itself in the Lebanese market through the years despite the presence of companies with high reputation. It targeted also the Middle East market mainly the golf region; since 1998 it established its offices in these countries for a better client service and support.

- **Market:** software design offers services to different sectors such as travel agencies, jewelry, restaurants, media, distribution, banks, and industry.
- **Technical environment:** Software Design ERP, Visual Dolphin with client/server architecture runs on SQL server. It uses the most recent technologies such as Windows 2000, integration with e-mail services, intranet architecture, and replication for synchronization of data between different Point of Sales (POS).
- **Products:** many modules exist under Visual Dolphin including:
 - Finance: the module covers general accounting, checks, bonds, management of payables and receivables, budget, and cash flow
 - Sales (retail and wholesale): It covers all the cycle from management of purchase orders, deliveries, invoicing, till follow up with clients. In case of distributed POS, replication can synchronize the data
 - Commission: it is a separated module related to sales and to collection of invoices, bonds, and checks

- Purchases: it follows the merchandise starting from placing the purchase order from a supplier till receiving merchandise and payment to supplier
 - Stock: this module covers stock management of the organization for production and follow up on cost and retail price
 - Assets: it is dedicated to the management of all assets of the company
 - HR: it includes management of salaries and all information related to personnel

- **Computec:** 20 years ago the Lebanese Computec company was founded. It started its activities in ERP market in the Middle East mainly Saudi Arabia and Lebanon. It accounts for about 20 employees including consultants, developers, engineers, and technicians specialized in the fields of management and computerization of small and medium enterprises.
 - **Technical environment:** it offers a complete service for its clients including delivery, installation, support, training, and maintenance of all there Oracle products. These products follow a series name called MACC, each consisting of a set of specific applications by sector. It is executed on client/server architecture; computers can be Windows 2000, UNIX, IBM X, HP UNIX, Sun Solaris, Linux or any Oracle infrastructure.
 - **Products:** MACC series consist of a combination of management accounting with cost control modules. It is the kernel of all applications

developed by Computec, each of which is dedicated to a specified sector based on the specifications:

- MACC: it groups standard solutions of general accounting such as payroll, cost center, receivable, and journal entry
- P-MACC: it is dedicated for production, and bills of material
- C-MACC: it is dedicated for contract management and sites
- D-MACC: it is dedicated for distribution
- R-MACC: it is dedicated for sales management, inventory, and financial reports

2.1.7 ERP in Lebanon

Knowing the importance of ERP for the organizations, and its expansion worldwide, Lebanon is one of the countries in which many of its enterprises have installed or are in the process of installing ERP solutions. These firms are installing or have installed either local or foreign ERP systems. Below is a list of some of these firms [40], listed by alphabetical order:

- ABC department stores
- Adballah Chahine & Fils
- Aishti
- Cesar Debbas & Fils
- Debbane Freres
- Foodstuff & Consumer Goods
- Holcim
- Sanita

- Sohat

2.2 DESCRIPTION OF IMPLEMENTATION AND EVALUATION METHODS

2.2.1 *Successful ERP implementation methods*

2.2.1.1 ERP implementation key success factors

According to Dr. Sun [29] there are three critical issues of packaged software that span in all phases including the implementation phase. These critical issues are:

- Customization: it includes three types
 - Configuration or selecting the options
 - Modification or changing program code to alter processing
 - Enhancement or adding program code or modules to the ERP system to provide additional functionality to the software
- Integration: companies are trying to integrate ERP applications, to improve performance, and standardize data so that there will be real time access to the functions
- Upgrades: companies are trying to implement an ERP application that has the facility to be upgraded at any time due to business needs

Although research in this area is still somewhat fragmented, various writers and commentators in the consultancy, commercial, and academic fields have identified factors that they argue can impact the outcome of ERP implementation, which are compatible with the key success factors identified by Dr. Sun [29], and these factors are:

- Realistic budget and proper allocation of resources

- Education of all key management personnel about ERP
- Strong top management support
- Centralized project management with business leader or project sponsor
- Strong Information Technology-IT management and staff support
- Selection of right approach to ERP
- Heavy user involvement from all affected areas
- Standardized business process re-engineering on software capabilities
- Retraining of existing software developers in ERP
- Extensive training of end users
- Use of consultants especially for implementation and training
- Allocation of a respected and effective champion from within the organization
- Effective and continuous communication
- “Top-notch” system analysts with good knowledge of the business and high technical skills
- Prevention or lack of analysts throughout the project and beyond
- Sensitivity to user resistance with the new system

2.2.1.2 Vendors implementation approach

Most vendors, especially in the software industry, have developed their own methodologies. Vendors primarily use methodologies as a marketing tool in order to alleviate the fears of the upper management when they are considering implementing a

major software application. Since SAP is the number one in the ERP market below is the implementation method used at SAP [3].

AcceleratedSAP (ASAP)

The ASAP Roadmap is a detailed project plan by SAP that describes all activities in an implementation. It includes the entire technical area to support technical project management and address things like interfaces, data conversions and authorizations earlier than in most traditional implementations.

The ASAP Roadmap consists of five phases:

- Project Preparation
- Business Blueprint
- Realization
- Final Preparation
- Go live and support continuous change

ASAP provides examples, checklists, or templates as samples. They are used as a starting point to avoid "reinventing the wheel." ASAP calls these the "Accelerators."

Phase 1 - Project Preparation: Proper planning and organizational readiness

assessment are essential which entails a determination of the following:

- Full agreement that all company decision makers are behind the project
- Clear project objectives
- An efficient decision-making process
- A company culture that is willing to accept change

AcceleratedSAP's "Project Estimator" can be used to guide the project team through a series of predefined questions, and drives interviews with senior executives and key operating managers about their expectations of R/3 – SAP's integrated software solution for client/server and distributed open systems – and the speed of its deployment.

Phase 2 - Business Blueprint: The "Engineer" delivers a complete toolkit of predefined business processes. During the Business Blueprint phase R/3's broad scope is narrowed to fit the industry-specific processes. Using questionnaires and the models from the "Business Engineer," the business processes are documented to reflect the future vision of the business. Industry templates further accelerate the process by predefining industry best business practices. The result is a comprehensive blueprint of the business. During this phase training begins on R/3's integrated business systems. Then come hands-on training, which provides a step-by-step education of R/3 business process skills. The "Business Blueprint" is a visual model of the business' future state. It will allow the project team to clearly define the scope, and only focus on the R/3 processes needed to run the business.

Phase 3 – Realization: Based on the "Business Blueprint," a two-step process for the beginning of configuring the R/3 system.

- First the baseline functions of the system will be configured
- Second the system is fine tuned to meet all of the business process requirements

Because the initial configuration is based on the blueprint, the baseline system gives a real-world view of how the business transactions will actually run.

Phase 4 - Final Preparation: In this phase, the R/3 system is fine-tuned. Necessary adjustments are made in order to prepare the system and the business for production start-up. Final system tests are conducted and end-user training is completed. Initial audit procedures are developed.

Phase 5 - Go Live and Support: In this phase, procedures and measurements are developed to review the benefits of the R/3 investment on an ongoing basis. SAP support and services are provided to ensure that the system continues to run smoothly. The Online Service System (OSS) provides electronic support using a remote connection. The “Implementation Assistant” provides answers for most questions that may arise. It is an easy-to-use repository of information defining what to do, who should do it, and how long it should take.

2.2.1.3 Consultancy companies’ implementation approach

Consulting companies also developed their own methodologies. Among the several consultancy companies only implementation processes will be covered. The first one is from Ernest and Young called “The Total Solution” and the second from Deloitte and Touche called “The Fast Track Workplan”

The Total Solution (Ernest & Young)

Ernst & Young has developed a system re-engineering approach called “The Total Solution.” The Total Solution approach has five components [3]:

Phase 1 - The Value Proposition: Building the business case. The key before any process can begin is to make sure it makes sound business sense. The following questions should be answered before the process is started:

- Is the technology investment justified?
- Does it match the company's objectives?
- Does management understand what change means, and does that change have full support?
- What is the framework for making decisions?
- What milestones will measure the project's progress?
- Is value being delivered throughout the process?

Phase 2 - Reality Check: Assessing an organization's readiness for change. Since many people oppose change; it is something that needs to be anticipated. Status quo is easy; change is not. Therefore, the following questions need to be asked:

- Is the organization ready for change?
- Are there any hidden agendas? If so, how will they be managed?
- Is everybody on board with the nature, scope, and pace of the change?
- What are management's expectations?

How those questions are answered will adjust the implementation approach. Knowing the answers upfront helps to avoid a possibility that the change does not match the client's reality.

Phase 3 - Aligned Approach: Setting expectations. Delivering short-term and long-term value. Short-term as well as long-term benefits are key to any project's success. Even if change is uncomfortable for some, it is easier to accept if progress is visible. In this approach, the following tasks are performed:

- Evaluate alternatives to a comprehensive reengineering project
- Craft a "best-fit" approach that allows the implementation to proceed in well-defined modules
- Communicate expected results to management. Keep communicating throughout the project so no surprises surface at the end. This approach helps keep the entire project on time, on budget and on management's agenda for success

Phase 4 - Success Dimension: The right blends of people, skills, methods, and management is important to the project's success. The implementation team should include people with skills in process management, change management, knowledge management, and industry skills. Teamwork is very important.

Phase 5 - Delivering Value: Measuring results and celebrating success. A project that does not show measurable results throughout the process is going to flounder. People will lose enthusiasm and the expectations of a new way of doing business become just another broken promise. It would be wise to make sure that every project pays continuous "value dividends" all along the way to minimize the risk of change.

The Fast Track Workplan (Deloitte & Touche)

Deloitte & Touche Consulting Group believes that their Fast Track implementation methodology can enhance and accelerate ERP software implementations no matter if the business objective involves global reengineering, process improvement or software replacement. The five phase Fast Track workplan with its specific activities help achieve a rapid high-quality business transformation [3]:

- **Scoping and Planning:** Project planning is initiated
- **Visioning and Targeting:** Vision and targets are identified
- **Redesign:** Software design and development are started
- **Configuration:** Integration is planned
- **Testing and Delivery:** System is delivered

Fast Track is designed to reflect and integrate decisions regarding business redesign, organizational change and performance, training, process and systems integrity, client/server technologies and technical architecture. Fast Track identifies five areas or groups as an individual thread that moves through its five-phase workplan. The areas and a list of the functions performed are as follows:

- **Project Management:** which includes project organization, risk management, planning, monitoring, communications, budgeting, staffing, and quality assurance
- **Information Technology Architecture:** which includes hardware and network selection, procurement, installation, operations, software design, development, and installation
- **Process and Systems Integrity:** which includes security and audit controls

- **Change Leadership:** which includes organizations design, change readiness, policies and procedures, and performance measurements
- **Training and Documentation:** which includes training design and delivery for project team, management, end-users, operations, and helpdesk

2.2.2 *Standard evaluation methods for ERP implementation*

Nowadays, the definition and measurement of ERP implementation success is a tough issue. Markus and Tanis [15] stated that success meanings vary depending of who defines them. According to them, optimal success refers *"to the best outcomes the organization could possibly achieve with enterprise systems, given its business situation, measured against a portfolio of project, early operational, and longer term business results metrics."*

Implementation success depends on factors other than the software; these factors are the people and organizational issues, change management, process realignment, training, and technical design. The key to successful implementation of an enterprise software solution is to apply people, process, and product initiatives within a structured methodology framework. When these elements are brought together and skillfully managed, companies can fully expect to realize shorter time to production, measurable business benefits, and a rapid return on their technology investment [32].

Research and best practice indicate that a typical process for evaluation of technology efforts involves giving attention to the following steps [31]:

- Identify basic issues / problems that need attention
- Develop revision strategies and priorities
- Determine what data will be necessary to obtain in order to make informed decisions
- Determine what new data will need to be collected
- Identify evaluation design
- Determine what tools and data acquisition strategies will be used
- Determine timelines and specific people responsible for evaluation
- Conduct evaluations
- Analyze data and develop conclusions

2.3 PREVIOUS WORK IN ERP IMPLEMENTATION METHODS

2.3.1 Existing ERP implementation methods

Below is a list of some previous work done in this field. They are mainly identified as the Bizentro implementation methodology, and the project phase model. In addition there are the different implementation approaches, and finally the combined approaches.

Bizentro implementation methodology consists of five phases [21]:

- **Phase 1 – Project launch:** In this phase, essential preparation for a successful project is done:
 - prepare a project plan
 - Form a project team

- Set up a steering committee
- Make a formal announcement of the project kick-off to the entire company.
- **Phase 2 – Analysis:** In this phase, a new work process is drawn in 3 steps:
 - The current work process is reviewed
 - The new standard work process is defined
 - The new work process is mapped with current business operation
- **Phase 3 – Application:** In this phase, the project team conducts GAP analysis, defines additional functions to be developed, draws the application requirements of the company's new process, and performs configuration of the master data. In addition, the project team tests if the additional functions are operating properly.
- **Phase 4 – Implementation:** This phase is a preparatory period for full-scale operation. The project team establishes a detail implementation plan for the final system to operate properly in the real work environment, conducts final configuration and release, stabilizes the system, and provides training and education for the end users.
- **Phase 5 – Closing the project:** In this phase, the project team and the customer close the project, announce the official closing of the project to the entire company, and analyze the project outputs.

Below is the project procedure paradigm

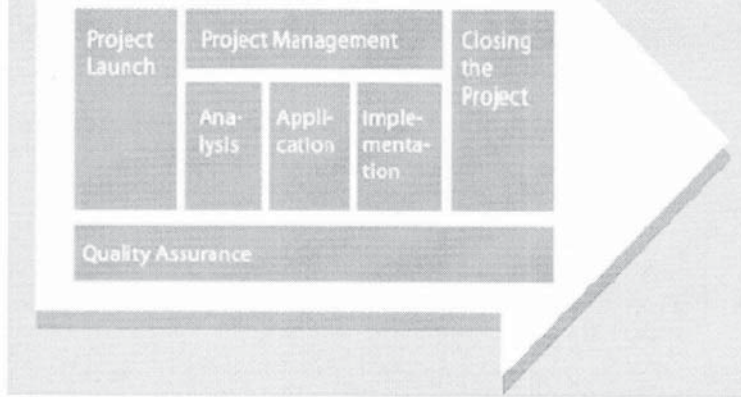


Figure 2: Bisentro implementation methodology

Parr and Shanks [19] developed a synthesis of existing ERP implementation process models that attempted to focus attention on the actual project stage of the implementation process. They refer to their model as the project phase model (PPM) and suggest that it, in conjunction with associated key success factors, provides guidance for practitioners in the process of planning ERP implementations.

It is focused on the implementation project stage, which other models seem to collapse into one unit. Parr and Shanks through this model also claim an attempt to focus on the factors which influence a successful outcome at each of the implementation phases. They offer three arguments to justify this approach ([16], [19]):

- PPM identifies the discrete sub-phases of the project while also recognizing the importance of the planning and post-implementation phases.
- The PPM relates success factors to the phases of the ERP implementation process, which experts in ERP implementation believe lead to successful implementation

- The PPM is concerned with the concept of project “success”, which, for their purpose, simply means bringing the project in on time and on budget. Parr and Shanks further posit that the project concept of success involves the contribution of the ERP to the performance of the implementing company

No two organizations will approach an ERP implementation in exactly the same way.

The actual ERP implementation itself can occur using one of four methods [12]. These methods are:

- Parallel
 - Phased
 - Big Bang
 - Pilot
-
- **Parallel:** involves running both the old system and the new system concurrently. This is usually done by performing intensive training to the users. It is usually used for financial modules, to make sure that both systems will provide the same results [12]. Systems will not give the same results due to the following reasons [12]:
 - The users will be overloaded to work on both systems
 - Systems will have different business processes
-
- **Phased:** is to gradually introduce the system into the organization one module at a time. It could be done for any module. It is required in large organizations or

one that is extremely resource constrained during the implementation. The disadvantages of this approach are [12]:

- The length of time the implementation takes, and people must support both the old and new systems
 - Not all the necessary information is available until the system is completely implemented
-
- **Big bang:** describes the practice of setting a cutover date and on that date turning the old system off and the new system on. Using the big bang approach people learn the new system, and stop using the old system. Disadvantages are if users have not learned in advance how to perform their functions proficiently [12].
 - **Pilot:** is becoming the preferred method by most implementers. Users are trained in their functions and then, a pilot starts for the selected group of items to process on the new system. Normal business proceeds on the old system and only the pilot items are transacted on the new system. The pilot method is often combined with either the “phased” or “big bang” methods [12].

Parr and Shanks [20] identified combined characteristics in three approaches:

- **Comprehensive implementation:** this type of implementation is good for large and expensive projects. It is often done when multiple, international sites are involved, since it requires a challenging project management. During this implementation BPR is important; to try to optimize business processes locally or

work out harmonized centralized processes, and based on the results to minimize technical, and organizational risks. This approach takes full advantage of an ERP package; it implements most or all the modules, industry-specific modules, and internally developed or third party modules.

- **Middle-road implementation:** this type of implementation requires between 1 and 3 years. It is often implemented at single site or at a few similar sites. BPR is included but just to try to find a fit between optimized processes and standard ERP functionality. Depending of BPR results, small or major modifications to system might be needed, either technical or organizational risks. This approach follows no typical implementation strategy.
- **Vanilla implementation:** this type of implementation is good for small projects and requires less than one year. It is often implemented at one particular site with no coordination with other sites. It tries to align the organization to standard enterprise system functionality, no significant modification of standard functionality, and no technical risks-substantial to the organizational risks. Usually only core enterprise system functionality are considered

2.4 RESEARCH MOTIVATION

2.4.1 Identified weaknesses in previous ERP implementation methods

The methodologies that were discussed earlier seem to ignore the evolution and retirement phases. This might be due to the fact that they are primarily implementation methodologies. They are mainly focusing on adoption decision, acquisition, implementation, and user support and maintenance phases. Companies using an ERP need to take into consideration the evolution and the retirement phases because they will live with their system for the next five to ten years. They need to take into consideration the ERP lifecycle. So, successful ERP implementations methodologies need to go beyond the implementation stage. In addition, none of the above mentioned implementation methodologies talk about data conversion from existing systems from the technical point of view. Moreover, none has taken the technical design into consideration in their implementation process. Add to that in all the phases neither the input nor the output of the phase were specified. Also, none has mentioned the business continuity as a task for the ERP implementation. Not a single method introduced the use of use cases in the requirements gathering of the data from the users; on the other hand other tools were used. All the methods ignored the importance of user security, users job descriptions, and end-users training plans and manuals.

2.4.2 Project justification

Each of the above mentioned implementation method has its advantages and disadvantages; however, a new methodology will be introduced in this thesis by

identifying the factors which influence the implementation phase of ERP. Since none of the studied ERP implementation methods talks about technical design, it will be introduced in this study, and a focus on data conversion will be set. In addition, the evaluation of the success of the implementation method will be highlighted in this thesis. Refer to section 1.3 Research Objectives in this thesis for further information on the thesis justification.

CHAPTER 3: ORIGINAL WORK

3.1 ANALYSIS OF ERP IMPLEMENTATION PHASE

3.1.1 *The model parts*

The proposed ERP implementation methodology will be called PDIA. The PDIA approach is divided into four main parts:

- **Planning and preparation**
- **Design**
- **Implementation**
- **Audit and fine tuning**

The project performance measure task runs in parallel with the four main parts.

The design and implementation parts are in their turn divided into main sub-parts. The design is divided into two sub-parts:

- Change program
- Technical design

While the implementation part is divided into three main sub-parts:

- Training
- Communication
- Go Live

Figure 3 shows graphically the parts, sub-parts, and the two main tasks covered in the proposed model.

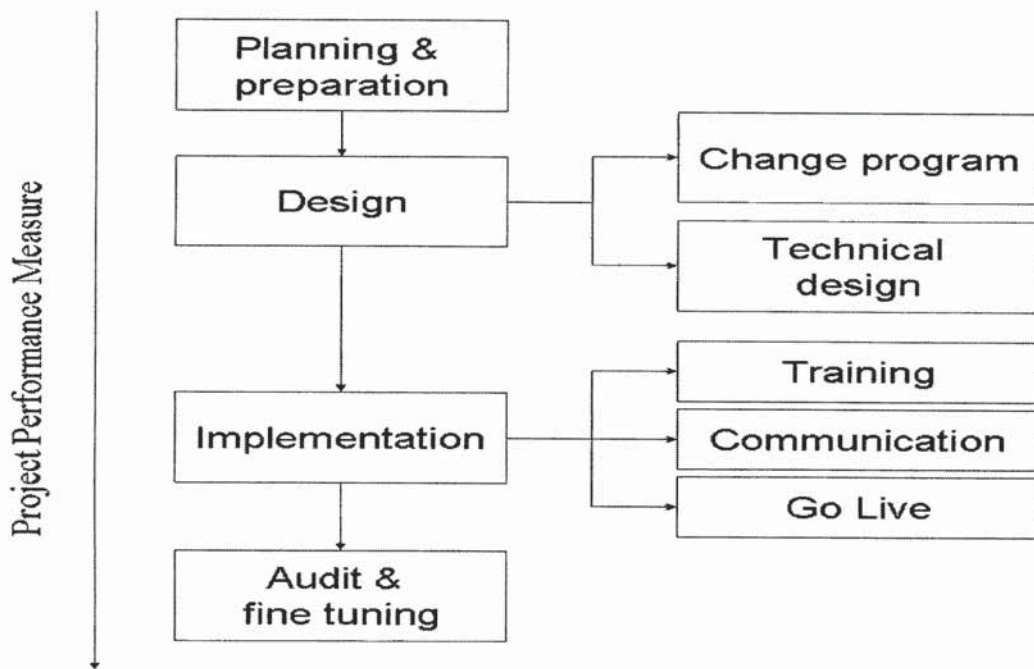


Figure 3: The PDIA Model

3.1.2 The tasks

All of the PDIA parts are divided into different number of tasks, varying from one part to another. Some of the tasks can run in parallel, while others require other tasks to be performed before they start. Below is an overview on the major tasks in each part.

Planning and preparation part main tasks are:

- **Setting objectives:** this task should identify the companies' short and long term objectives for the ERP implementation. They should be clearly set to match with the company strategy, mission, vision, and targets. The scope of the project should be specified, and include all the processes needed to run the business. The objectives set should be defined in quantitative terms, to be able to measure their performance later, for example increase the gross margin return on investment –

G.M.R.O.I. to become 2.5 in the next two years – short term, between 2.5 and 3.5 in the next five years – for the long term.

- Top management support: Top management should be aware and support change. They should agree that the whole organization environment should be ready to accept change. Their availability and involvement will facilitate the implementation process
- Decision makers frameworks: an efficient decision making process should be defined. A project sponsor should be assigned one at the organization and another one at the supplier side
- Milestones of project process: all the milestones should be defined at this stage. Based on the milestones the project process will be measured
- Project organization: the full organization details of the project will be decided. A check list of the related tasks should be set
- Risk management: this task starts at the beginning of the project and continues throughout the project implementation process. It identifies the risks that might be faced, and proposes an alternative solution or contingency plans, to face the problems and be able to easily overcome them
- Planning and monitoring: an initial project plan is initiated and will be monitored for all the tasks. For each task their should be assigned resources, time schedule, cost, and should be inline with the project scope
- Communication: communication between the different concerned parties should be formalized, followed-up, and ensured through the whole project lifetime

- Budget: project implementation budget is set and will be monitored, and updated for justifiable return on investment-ROI
- Team formation: this task consists of the selection of the team members as well as the external consultants if needed for business purposes
- Quality assurance: it starts with the project and ends after it. Its purpose is to ensure the output of each task is the desired one. It is mainly setting quantitative measures for each task
- Steering committee: a steering committee should be set for the project. All decisions should be approved by this committee. It should meet regularly on continuous basis during the implementation phase
- Kick-off meeting: it is a meeting or event in which the project launch or the official announcement of the project to the entire organization is done

Design part main tasks for the change program sub-task are:

- Review and understand current work process: assessment of the prevailing situation by reviewing and understanding current situations by conducting either face to face meetings or focus group meetings with the end-users and managers. The requirements gathering from the users were based on a guideline questionnaire related to the subject area. The collected data was documented using use-cases. Use cases are a standard technique for gathering requirements in many modern software development methodologies. It is a narrative document that describes the sequence of events of an actor (an external agent) using a system to complete a process. The introduction of the use cases to this phase was

new, and was not mentioned in any of the documents of the literature review done during the thesis study.

- Define new standard work process: also known as the business process re-engineering, which consists of identifying the new tasks and modifying existing ones. New preparation of the processes should specify who should do what, when and how? to ensure business continuity. The new business policies and procedures of the organization should be set at this stage
- Organization design: identify the new organization chart and the new positions in the organization. Using advanced drawing tools the organization chart should be drawn to be distributed to the user at a later stage

Design part main tasks for the technical design sub-task are:

- Team training: detail training for the team on the ERP software, the hardware, the network, and the security requirements for the ERP implementation
- Hardware configuration: all the servers, computers, and peripherals related to each business should be configured and set
- Network configuration: all network either LAN, WAN, or leased line, etc. should be configured to be inline with the hardware and the new ERP system
- System configuration: all operating systems, required software, data links, and ERP application should be configured by installing the systems and setting the default values, and necessary functions for the ERP to be ready
- Security configuration: system (administrator privileges), users (specify role), and data (back-up & recovery) security configuration should be conducted

- Data conversion / system integration: this task is an optional task, which could explain why some of the existing methods do not mention it. It is the process of moving data from the old system to the ERP system. A detailed focus on this task will be conducted in section 3.4 of this thesis
- System testing: testing all the system functionalities by setting priorities to the business continuity ones to be done first. The testing should cover all the business functionalities, the data converted and the system outputs
- Gap analysis: analysis of the system should be conducted to identify the weaknesses, and propose new solutions to solve them before advancing into the implementation process
- Define additional functions: an optional task that requires the definition of new functions which are identified to be necessary and provide asset to the business
- Fine tuning of configuration: testing of all the newly defined or modified functions in the system

Implementation part main tasks for the training sub-task are:

- Prepare training material / user guides: preparing manuals about the system, the business policies and procedures, and job descriptions. Advances business tools could be used to facilitate the documentation process of this task such as Microsoft Visio, and Microsoft Office
- End-user training plan / training: setting a plan for the user training on the system, and training them. A detailed training plan should be done using any planning tool (ex: Microsoft Project). Some efforts might be required from the users to assure business continuity

- Implementing studied security: applying the security identified in the security configuration task on the ERP

Implementation part main tasks for the communication sub-task are:

- Design detailed implementation plan: set the full details needed for implementing or installing the ERP successfully.
- Affecting people to the new organization plan: assigning the right people with the right skill to the right task
- Assign new jobs: optional task which includes the communication of new job descriptions for new assigned jobs

Implementation part main tasks for the go live sub-task are:

- Go live: system running up with one condition which is business continuity

Audit and fine tuning part main tasks are:

- Business audit: studying if the implementation of the procedures are done properly
- System audit: studying the system security, the required output, by focusing on the quality assurance of the system
- Fine tuning business: all modifications related to the business policies and procedures
- Fine tuning system: all modifications either in the system or its configuration to adapt with the business needs
- Maintenance and support: help desk for the end-users and system maintenance such as back-up, keeping the last version of the software, etc. Maintenance should

be performed regularly, and a schedule for the maintenance tasks should be set in advance

- Continuous enhancements: continuous enhancements to the business policies and procedures as well as adaptation of the new requirements which might require modifications to policies and procedures of the business

3.1.3 *The task's matrix*

All tasks are written in a matrix format, one matrix for each part of the PDIA model. The matrix consists of the following column header:

- Part: the part to which the task belong
- Task: the task identified name
- Responsible: the person who is responsible for performing this task
- Dependency: if this task is dependant of a previous task
- Deliverables: what will be the output of this task – the documentation content and layout of the deliverables is subjective and vary from one organization to another, and are left out of scope of the thesis
- Milestones: what is the significant event in this task

Table 4 represents the task matrix of the planning and preparation part of the PDIA model.

Part	Task	Responsible	Dependency	Deliverables	Milestones
Planning & Preparation	Setting objectives	Top management	Company's target, mission, vision, and targets	List of objectives and project scope (functions and features)	Project scope and objectives
	Top management support	Project manager, steering committee		Top management commitment to support change	
	Decision makers frameworks	Project manager		Decision making process, assignment of project sponsor	Assignment of project sponsor
	Milestones of project process	Project manager	Planning & monitoring	List of milestones tasks	Approval of milestone list
	Project organization	Project manager		Project organization check list	
	Risk management	Project manager, steering committee	Planning & monitoring	Contingency plans for all significant risk factors	
	Planning & monitoring	Project manager, project team, steering committee	Budget	High level project plan, and project monitoring tool	Approval of project plan
	Communication	Project manager, project sponsor, steering committee		Encouragement of communication in a formal way	
	Budget	Top management, project manager, steering committee		Implementation budget	Approval of implementation budget
	Team formation	Project manager	Budget	Project team selection, external consultants if needed	Project team
	Quality assurance	Project manager, functional manager		Quality assurance plan	Approval of QA plan
	Steering committee	Project sponsor, top management	Setting objectives	Selection of steering committee members	
Kick-off meeting	Project sponsor, steering committee	ERP selection	Project overview document that contains the project scope and all the plans	Approval of project overview document	

Table 4: PDIA task matrix for the planning and preparation part

Table 5 represents the task matrix of the design part of the PDIA model separated by the sub-parts: change program, and technical design.

Part	Task	Responsible	Dependency	Deliverables	Milestones
Design / Change Program	Review and understand current work process	Functional manager, functional team	Planning & monitoring	Documentation for the as is situation and new user requirements using use cases	Approval of documentations
	Define new standard work process	Functional manager, functional team	Review and understand current work process	Functional specifications document definition of new tasks (policies and procedures), new preparation (job descriptions), and	Approval of functional specifications (new business policies, procedures, and job descriptions)
	Organization design	Project manager, project sponsor, steering committee	Define new standard work process	New organizational chart	Approval of new organizational chart
Design / Technical Design	Team training	Project manager	Planning & monitoring	Technical and functional training manual	Approval of technical and functional training document
	Hardware configuration	Technical manager, technical team	Team training	Hardware configuration document	Approval of hardware configuration document
	Network configuration	Technical manager, technical team	Team training	Network configuration document	Approval of network configuration document
	System configuration	Technical manager, technical team, functional team	Team training and define new standard work process	System configuration document and system specification document	Approval of system configuration and system specification document
	Security configuration	Technical manager, technical team	Team training	Security configuration document	Approval of security configuration document
	Data conversion / system integration	Technical manager, technical team, functional team	System configuration	Technical data conversion document	Approval of data conversion document
	System testing	Technical manager, functional manager	System configuration and data conversion	Testing plan and system testing	Approval of data converted results and of system data results
	Gap analysis	Technical team, functional team	System testing	Gap analysis document that contains proposals for enhancements	Approval and development of modifications proposed in gap analysis document
	Define additional functions	Functional team	System testing	Request for additional functions in the system	Approval and development of requested functions
	Fine tuning of configuration	Technical team, functional team	Gap analysis and define additional functions	Update on system configuration document	Approval of system results and system documents

Table 5: PDIA task matrix for the design part

Table 6 shows the task matrix of the implementation part of the PDIA model separated by the sub-parts: training, communication, and go live.

Part	Task	Responsible	Dependency	Deliverables	Milestones
Implementation / Training	Prepare training material / user guides	Functional team	Fine tuning of configuration	User training manual, business policies and procedures, job descriptions	Approval of manuals, policies, procedures, and job descriptions
	End user training plan / training	Functional manager, functional team	Prepare training material /user guides	Training plan	Approval and implementation of training plan
	Implementing studied security	Technical team	Fine tuning of configuration	Update security configuration	Approval and implementation of security
Implementation / Communication	Design detailed implementation plan	Technical manager, functional manager	End user training	Implementation or go live plan	Approval of go live plan
	Affecting people to the new organization plan	Project manager	Design detailed implementation plan	User profile document (assign users to jobs)	Approval of user profile document
	Assign new jobs	Project manager	Affecting people to the new organization plan	Communication about new jobs	
Implementation / Go Live	Go live	All	All	System running	Business continuity

Table 6: PDIA task matrix for the implementation part

Table 7 shows the task matrix of the audit and fine tuning part of the PDIA model.

Part	Task	Responsible	Dependency	Deliverables	Milestones
Audit & Fine Tuning	Business audit	Functional team, Audit team	Go live	Business audit report	Approval of business audit report
	System audit	Technical team, Audit team	Go live	System audit report	Approval of system audit report
	Fine tuning business	Functional team	Business audit	Update functional specifications document	Approval of functional specifications document
	Fine tuning system	Technical team	System audit	Update system specifications document	Approval of system specifications document
	Maintenance and support	Technical team	Go live	Maintenance and support report	Application that keeps records for maintenance and support tasks
	Continuous enhancements	Functional team	Go live		

Table 7: PDIA task matrix for the audit and fine tuning part

Table 8 is the task matrix of project performance measure of the PDIA model.

Part	Task	Responsible	Dependency	Deliverables	Milestones
	Performance measure	Project manager	All	Output progress report for each task	Project management and quality assurance

Table 8: PDIA task matrix for the audit project performance measure

Setting measurements for each task by measuring the progress or the output of each task, which is part of the project management, should be conducted for all the tasks. Task monitoring could be done using advanced tools, such as “Microsoft Project”.

The roles of the main responsible people in the implementation process of the ERP are defined:

- **Role of Top Management:** the role of Top Management is the acceptance of change. Their main role resides in spreading the idea of change in the organization environment. They set the project objectives, and approve the budget. They assign the Project Sponsor.
- **Role of Project Sponsor:** the role of the Project Sponsor is to chair the Steering Committee as well as the Project Manager. Typically, the Sponsor is expected to attend all the Steering Committee meetings, and be available as needed for meetings. He / she must have budget authority in order to make scope changes to the project.
- **Role of Steering Committee:** the role of the Steering Committee is to provide high-level business direction for the implementation project. This committee generally meets regularly throughout the project to review progress and provide issue resolution. This committee is responsible for creating the project overview document, which based on its approval the project can proceed.

- **Role of Project Manager:** the role of the Project Manager is to set project plan, by setting tasks, assigning resources, and scheduling time for each task. His / her main task resides in the project monitoring and follow-up for the set plan. In addition, the Project Manager plays an important role in the communication and coordination of the project. The Project Manager assures the project quality and measure performance using advanced tools.
- **Role of Functional and Technical Teams including managers:** the role of each member is to define and approve the detailed project plan as well as perform the specialized tasks needed to complete the project. Each team member is expected to attend all team meetings, in order to provide continuous status of the tasks assigned to them. While the managers role is to lead the teams including initiating standard meeting days, times, and locations. Their role is to resolve issues and raise them to the Project Manager in case of scope change request. In addition their role is to report to the Project Manager.
- **Role of Audit Team:** the role of the Audit Team is to ensure that all the set business policies, procedures, and system functions are properly applied. They are assisted by the functional and technical team to perform this task.

3.2 FACTORS THAT INFLUENCE ERP IMPLEMENTATION

3.2.1 *The critical success factors - CSF*

The definition of success depends on the point of view as people often mean different things when talking about information systems or ERP success. After the review of

literature a list of critical success factors was identified by David & Bernard [30], the list was amended by other critical success factors that were identified from the reading of the different articles. Thus the below list is the adapted one that matches with the ERP implementation model designed in this thesis. Hence, the full list of the critical success factors is:

- Top management, project sponsor, and steering committee commitment and support: reactivity (response time, availability, and presence) of top management project sponsor, and steering committee on reported problems
- Business process reengineering: finding the balance between the analysis of the existing and the best practices, by adapting the best practices to the business needs. The documentation of the business policies and procedures is of high importance
- Use of project management to manage implementation: setting the project plan, amending it for justifiable cases, and monitoring the performance of each task
- Change management culture and program: understanding of all members for the reason of change, while keeping the top management, and project sponsor aware and involved in the change to minimize the risk of having resistance to change
- Measurable objectives: if the objectives set are measurable or not
- Align budget to objectives: optimize the return on investment set in the objectives
- Selecting the right team: if the team who implemented the project is the right one
- Distribution of workload: distribution of workload should be homogeneous, it should be optimized where there should be no days in which the member is either overloaded or under-loaded

- Assess project risks and define contingency plan: there should be contingency plans for all risky cases else the risk management would not have been analyzed properly
- Pertinence of training to technical team: technical team should be able after the training to solve all problems and have the necessary know-how of the system
- User training and education: user training and education should assist the users themselves by solving the simple problems before calling for support
- Effective communication: communication about the project to all the organization, all the organization should know about the project and the reason of its existence
- Added value of ERP consultants: if after applying consultants recommendations the desired output was produced or not
- User participation: the user involvement in the business decisions of the whole project
- Motivation of all team members: if the team is motivated, then all the tasks will be smoothly done
- Configuration and integration of the system adapted to business needs: if the system is configured properly in a way that the business procedures do not have to be modified
- Project driven by business needs or appropriate management expectation: if the project analysis is done then the technical analysis is adapted to it
- Documentation of business and technical parts of the project: if the standard business and technical documentations are done, if they are easy to use and understanding, and if they cover all the project topics
- Software testing and troubleshooting: if the software is free of bugs that interrupts the business and matches with the business needs of the organization

- Monitoring, follow-up and evaluation of performance of the plan: if the follow-up is done appropriately and the results are done on time and with the required quality
- System security: if the system is secure on the different transaction types
- Continuous enhancement: if a regular evaluation for procedures and system are done
- Adequate control: if a regular procedure for control exists and is performed
- Continuous control on budget: if the budget amendment has a return on investment
- Data conversion: if the data conversion method used is efficient and all data required are available in the new system

3.3 ERP IMPLEMENTATION METHOD EVALUATION MODEL

3.3.1 *The evaluation*

To evaluate an ERP implementation means to measure the success or failure of the ERP implementation, by showing its strengths and weaknesses. In other words it is showing the advantages and disadvantages of the newly defined ERP implementation model. None of the read articles specify a standard evaluation method for implementation in general and for ERP implementation precisely.

3.3.2 *The PDIA evaluation model*

The proposed ERP implementation evaluation method will be only concerned with the identified critical success factors for the ERP implementation method, because it is considered that if the critical success factors were either successful or not, then the whole list of tasks will either succeed or fail.

The proposed method uses an idea that takes the frequency of identifying the critical success factor in the review of literature. An already done statistics [30] were used, but they were updated based on additional literature review. Based on the frequency identified a weighting percentage is calculated for each critical success factor. These critical success factors are grouped or categorized into the four main parts of the PDIA model. Thus, a weighting percentage is computed for each part of the ERP implementation model identified. The evaluation of each part of the model will be computed from the sum of the evaluation of its corresponding critical success factors. The evaluation of each critical success factor will be based on a scoring system, in which each factor will be assigned a specified score ranging from 1-3 (1 being low, 2 being medium, and 3 being high). To assign a score for a factor a specified way is set for each critical success factor to assist in setting a score, and avoid as much as possible the subjectivity of the scoring of a factor in particular and for the evaluation in general.

The proposed evaluation method is subjective but the scoring for each task could be done using a guideline to minimize the subjectivity - which is shown in the latter part of the section. A certain level of subjectivity will remain as minimal and will assist to approach from objectivity as much as possible.

Table 9 shows the categorization of the critical success factors into the four main parts of the PDIA model with the total weight for each factor, and table 10 shows the weight for each part as a whole.

#	Critical success factor	Frequency of occurrence in literature	Weight	PDIA Part
1	Top management and project sponsor commitment and support	16	10.60%	1
2	Business process reengineering	16	10.60%	2
3	Use of project management to manage implementation	15	9.93%	1
4	Change management culture and program	14	9.27%	1
5	Measurable objectives	13	8.61%	1
6	Selecting the right team (competence)	12	7.95%	1
7	User training and education	9	5.96%	3
8	Effective communication	9	5.96%	1
9	Added value of ERP consultants	8	5.30%	2
10	User participation	5	3.31%	2
11	Configuration and integration of the system adapted to business needs	5	3.31%	2
12	Project driven by business needs or appropriate management expectation	4	2.65%	1
13	Assess project risks and define contingency plan	3	1.99%	1
14	Motivation of all team members	3	1.99%	3
15	Documentation of business and technical parts of the project	3	1.99%	2
16	Software testing and troubleshooting	3	1.99%	2
17	Plan monitoring, follow-up and evaluation of performance	2	1.32%	4
18	Align budget to objectives	2	1.32%	1
19	System security	2	1.32%	2
20	Pertinence of training to technical team	2	1.32%	2
21	Distribution of workload	1	0.66%	1
22	Continuous enhancement	1	0.66%	4
23	Adequate control	1	0.66%	4
24	Continuous control on budget	1	0.66%	4
25	Data conversion	1	0.66%	2
	Total	151	100.00%	

Table 9: Frequency, weight, and PDIA part for each critical success factor

PDIA Part	Number of factors	Weight
1	10	58.94%
2	9	29.80%
3	2	7.95%
4	4	3.31%

Table 10: Weight of each PDIA part with number of critical success factors in each part

Figure 4 is a graphical representation of the weight among the four parts of the PDIA model

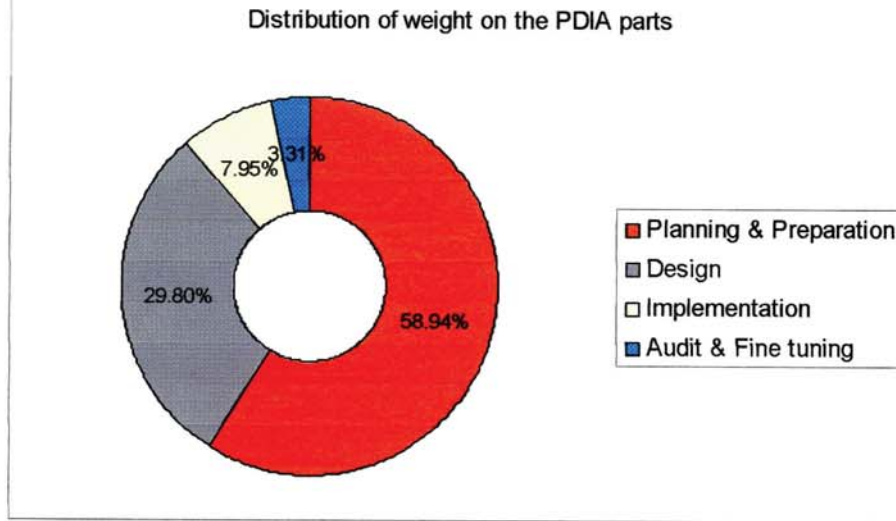


Figure 4: Distribution of the weight on the PDIA parts

To assign a score for each critical success factor, and knowing that some of the critical success factors are general while others are detailed, a guideline, is set for each factor to assist in transforming the scoring subjectivity as much as possible into objectivity. The guidelines used are subject to big discussions and more complex analysis to remove the subjectivity that exists in them, but this is out of scope of the thesis.

Below is the set of critical success factor with a guideline for selecting the score with less subjectivity.

Top management, project sponsor, and steering committee commitment and

support: will be measured based on the response time and availability with respect to the number of requests

- 1- availability is above two weeks

- 2- availability is more than one week and less than two weeks
- 3- availability is less than one week

Business process reengineering: will be measured based on the existence of three parts: the study of the as is, the study of the to be, and documentation of the business policies, procedures and job descriptions

- 1- availability of any part of the above mentioned ones
- 2- availability of two tow parts from the above mentioned ones
- 3- availability of all of the above mentioned parts

Use of project management to manage implementation: will be measured based on the plan amendments done either to the tasks, or resources, or schedule / time

- 1- plan amendments for all of the above mentioned
- 2- plan amendments for two of the above mentioned
- 3- plan amendments for one of the above mentioned

Change management culture and program: will be measured based on the rate of the resistance to change

- 1- rate of resistance to change is more that 50%
- 2- rate of resistance to change is between 25 – 50%
- 3- rate of resistance to change is less than 25% or no resistance to change

Measurable objectives: will be measured based on the objectives type (quantitative or qualitative)

- 1- none of the set objectives are measurable
- 2- selection of the set objectives are measurable
- 3- all set objectives are measurable

Align budget to objectives: will be measured based on the variation of the ROI with respect to the set objectives

- 1- if variation is less than the objectives by 10%
- 2- if variation is between zero and 10% less than the objectives
- 3- if no variation exist or it is a positive variation

Selecting the right team: will be measured based on the ability of the member to resolve problems by himself / herself, respect plan deadlines, and the quality of work produces

- 1- availability of one of ability to resolve problem, respect of plan, quality of work
- 2- availability of two of ability to resolve problem, respect of plan, quality of work
- 3- availability of three of ability to resolve problem, respect of plan, quality of work

Note that: we should analyze the criteria of quality of work cautiously, in case of low score. It could be from the plan, or from the objectives amendments, before concluding that it is from the team

Distribution of workload: will be measured based on the rate of the members that are under-loaded or overloaded

- 1- more than 50% under-loaded or overloaded
- 2- less than 50% under-loaded or overloaded
- 3- no under-load or over-load

Assess project risks and define contingency plan: will be measured based on the number of discovered risks that were not analyzed and their impact on the business

- 1- if newly discovered change to the original plan that impacts the ROI and interrupts the business
- 2- if newly discovered change to the original plan that impacts the ROI but does not affect the business
- 3- if newly discovered change to the original plan that does not impact anything

Pertinence of training to technical team: will be measured based on the rate of resolved problems by the team compared to the rate of reference to the supplier

- 1- if rate of resolved problem is less than 25% and the frequency of reference to supplier is for the remaining cases
- 2- if rate of resolved problem and frequency of reference to supplier are between 25 – 50%
- 3- if rate of resolved problem is greater than 50% and frequency of reference to supplier if for the remaining cases

User training and education: will be measured based on the average number of requests per user for a specified period - week

- 1- if average request / user is greater than 5
- 2- if average request / user less than 5
- 3- if average request / user is zero

Effective communication: will be measured based on the rate of awareness about the project

- 1- less than 25% are aware about the project
- 2- between 25 – 50% are aware about the project
- 3- more than 50% are aware about the project

Added value of ERP consultants: will be measured based on the ROI achieved after performing the consultant recommendations

- 1- if consultants recommendations are done and the results arrived to less return on investment than the set objective
- 2- if consultants recommendations are done and the results arrived to the same return on investment as the set objective
- 3- if consultants recommendations are done and the results arrived to greater return on investment than the set objective

User participation: will be measured based on the rate of involvement of the users in the business decisions

- 1- less than 25% of the business solutions taken with the involvement of end users

- 2- between 25-50% of the business solutions taken with the involvement of end users
- 3- more than 50% of the business solutions taken with the involvement of end users

Motivation of all team members: will be measured based on the ability of members to respect plan, produce good quality of work, and cause no tasks delay

- 1- availability of one of the above
- 2- availability of two of the above
- 3- availability of all of the above

Note that: we should analyze the criteria of quality of work cautiously, in case of low score. It could be from the plan, or from the objectives amendments, before concluding that it is from the team member

Configuration and integration of the system adapted to business needs: will be measured based on the number of business process changes to work with the configuration

- 1- change the business process to work with the system with no work around
- 2- change the business process to work with the system with work around
- 3- no business process changes were done to meet with the system configuration

Project driven by business needs or appropriate management expectation: will be measured based on the way the business procedures definition is done

- 1- business are defined based on technical definition

- 2- business procedures are modified based on technical constraints
- 3- business procedures are provided to the technical to adapt to them

Documentation of business and technical parts of the project: will be measured based on the existence of standard documentation, documents updated, and the frequency of reference by the staff

- 1- availability of one of the above
- 2- availability of two of the above
- 3- availability of all of the above

Software testing and troubleshooting: will be measured based on the type of bugs if they are blocking the system or not

- 1- if the bugs discovered by the user block the business
- 2- if the bugs discovered by the user have workaround
- 3- if no bugs were discovered by the user

Monitoring, follow-up, and evaluation of performance of the plan: will be measured based on the follow-up system

- 1- if no follow-up system exist
- 2- if selective follow-up is done
- 3- if there exist a system for follow-up

System security: will be measured based on if the security system is applied or not

- 1- if no security is applied
- 2- if selective security is applied
- 3- if all security is applied

Continuous enhancement: will be measured based on the continuous enhancement system

- 1- if no continuous enhancement approach exist and audit team does not perform procedures evaluation
- 2- if no continuous enhancement approach exist but audit team perform procedures evaluation
- 3- if continuous enhancement approach exist and audit team perform procedures evaluation

Adequate control: will be measured based on the control system

- 1- if no control procedure exist and audit team does not perform procedures evaluation
- 2- if no control procedure exist but audit team perform procedures evaluation
- 3- if control procedure exist and audit team perform procedures evaluation

Continuous control on budget: will be measured based on the ROI of the project with respect to the budget

- 1- if project has gone over budget and no justified return on investment
- 2- if project has gone over budget but there is return on investment

- 3- if project has gone either under budget or respected the budget

Data conversion: will be measured based on the correctness and accuracy of the converted data

- 1- if primary information not converted or converted but set wrongly in the system
- 2- if secondary information not converted to the specified location in the system
- 3- if all data converted properly to the system

After scoring for each critical success factor the score is multiplied by the factor corresponding weight. The result of all the factors is summed up, and if the result was:

- 1- less than or equal to 1.5, then the implementation was failure
- 2- greater than 1.5 and less than or equal to 2, then if the value is closer to 1.5, then the implementation needs lots of modifications to become successful, if the value is closer to 2 then the implementation needs slight modifications to become successful
- 3- greater than 2 and less than or equal to three, then the implementation was successful

3.4 DATA CONVERSION

3.4.1 *Data conversion overview*

There are many traditional methods for data conversion; to study them in details is a big task which might be a thesis by itself. Therefore, the different types of conversion are out of scope of this thesis study. Only one method will be used with slight modifications, to cover the data conversion process to an ERP system. This method was published and

tested by OLAV Company on several ERP projects, which seemed a good reason to adapt it and use it [18]. The main advantages of using this method are:

- Data integrity: starts with the first step of data conversion and continuous till the last step, to identify problems earlier and avoid loading them into the live system
- Business process re-engineering using client data: BPR tests will be done using client data to proceed faster
- Documented review process: the full data conversion process is documented
- Shorter data conversion implementation cycle: the cost of transforming data will be lower
- Data warehouse a copy of the ERP
- Single source of data loaded, which is taken from the warehouse
- Reusability of data warehouse that could be used later and data could be easily refreshed

On the other hand the main disadvantages are:

- Duplicating the ERP database
- Additional hardware and software are required
- Requires high knowledge in the technical aspects of the ERP database

3.4.2 The challenges of data conversion in ERP implementation

The main challenges of data conversion in an ERP implementation are identified as [18]:

- Data conversion team: the success or failure of the new ERP is related to data conversion in general in which the data conversion team is part of it.

- Select the members that have good knowledge in the current information system, and computer infrastructure, who know the new ERP with the business policies, and have good communication skills. They should work and cooperate together, to solve the problems
- Data conversion environment: the data conversion team sets the hardware, network protocols, and the software for the data conversion process
- Data collection: collecting data from the different sources, by extracting the necessary and latest available information, then cleaning it to be ready for the ERP system
- ERP data base default values: a revision of the default values, and setting the appropriate ones should be performed before data conversion starts
- Data conversion and end-user participation: end-user involvement in the data conversion process, by showing the users the ERP system with the old system data
- Business Process Re-engineering and data conversion: since the BPR takes into consideration the initial system functions and the values that should be set in the ERP or extracted from the old system
- Data conversion plan: the data conversion process should be documented and detailed tasks should be planned. The plan should include resources for each task, and the time required for each task based on tests done before
- Data conversion and database: the transferred data should be subject to the system security definitions, system preferences and initial code table entries. Data integrity and referential integrity should be performed, the extracted data should have the both the referential and domain integrity to prevent errors when loading the data

- Data loading: loading the data into the ERP requires the use of database utility to load programs. The data conversion plan should be used here to establish the load of the initial system code values, execute the load programs in the correct sequence and capture and review errors during the load. Error recovery strategy must be developed
- System checkout: the system testing task starts after the data is loaded into the system. System data, security, and referential constraints should be checked

3.4.3 Data conversion steps

Table 11 summarizes the adapted data conversion steps.

Step	Description
Project scope	Definition of the data conversion scope
Project schedule	Setting the data conversion schedule
Data environment	Setup conversion warehouse data environment
Data	Define the data to be converted
Data mapping	Identify the data mapping method
Data base	Import the ERP database into the warehouse
Data extract	Extract all the data from the old system
Data entry	Manually enter data in data collection tools
Load large objects	Convert binary large objects to tables in the ERP if required
Clean up data	Clean the data
Import data	Import cleaned data
Import manual data	Import manually entered data

Step	Description
Security	Define ERP security
ERP database values	Define and review ERP data base values
Application values	Define and review application values
Default values	Define and review default values
Audit reports	Generate and review summary audit reports
Data integrity	Verify data integrity
Comparison table	Create comparison table
Data converted	Verification and validation of data conversion
Data conversion document	Produce project documentation package

Table 11: Adapted data conversion steps

Below is the explanation of the list of the adapted steps that are considered to be useful for the data conversion process:

1. The data conversion project scope should be defined
2. The project schedule should be set by using Microsoft Project or other planning tools
3. Setup conversion warehouse data environment which includes:
 - Setup analysts' workstation on local area network
 - Install and configure a database server (Microsoft SQL Server, it could be any other server)
 - Configure link options (TCP/IP, ODBC, etc.)
 - Install a data cleanup tool (visual Basic, Microsoft Access)
4. Define conversion warehouse data:

- Import the new ERP system Meta data from system tables
 - Create the new ERP tables in the data warehouse with support tables
5. Data mapping sessions: identifying a data mapping methodology should be utilized for the different business functions. These mappings might change with the continuous review of the business requirements
 6. Import the ERP original data base into the warehouse
 7. Extract all the data from the old system, clean it, create flat files which includes all fields and start the planned data conversion process
 8. Manually enter data in data collection tools:
 - for simple data entry tasks create spreadsheets
 - for more complex tasks build a database application
 - use multi-user network applications when possible
 - distribute standalone applications if required
 - import captured data into data cleanup tools if necessary
 - import clean data directly into the data conversion warehouse
 9. If the ERP requires load binary large objects, then data should be converted to these tables if required
 10. Cleanup data
 - using tools
 - writing scripts
 - through generating reports for control
 11. Import cleaned data into the warehouse
 12. Import manually entered data into the warehouse

13. Define ERP security matrix either import it from the old system or define a new one
14. Define and review ERP data base values in the warehouse data: document all updates done to security, database tables' values, etc.
15. Define and review application values in the warehouse: such as company, departments, system codes, etc.
16. Define and review default values
17. Generate and review summary audit reports
18. Verify data integrity (referential, domain, data, and balancing routines)
19. Create table comparison using different techniques
20. Verification and validation of data conversion:
 - First verification is done by the conversion team
 - Second verification is done by the functional team (using balancing routines (counts and totaling))
 - It is an iterative process and could be done several times
21. Produce final project documentation package that includes:
 - data conversion process overview
 - initial data residence
 - data mapping specifications
 - all other inputs
 - data load programs and all input files
 - final data residence
 - all control reports

CHAPTER 4: PRACTICAL CASE STUDY

4.1 ERP MERCHANDISE PLANNING MODULE IMPLEMENTATION AT A LEBANESE RETAIL COMPANY

4.1.1 *About the company*

Retailer Group has been a leading retailer in the Middle East since its inception in 1936, with a full line department store, 2 shopping centers and – small to medium sized stores. The only retail business in the Middle East member of the International Association of Department Stores (IADS), Retailer boasts over 60,000 m² of retail space, with highest non food sales figures per m² in Lebanon.

Retailer department stores are positioned as mid to high end outlets providing a full range of non-food products at competitive prices, as well as fashion and tableware items, including Lebanon's largest and most upscale cosmetics and perfume department.

Over 100 regional and national retailers of international brands have opened concessions in Retailer, whose philosophy is to provide its customers with a wide selection of goods underpinned by quality, service and professional know how. The Group enjoys one of the highest brand awareness in the region.

Retailer goes into partnership with only the most respected retailers, as Retailer considers that its reputation stands or falls on the quality of goods and services offered. Retailer's brands awareness among Lebanese shoppers rates at 97 percent.

With over 1,000 employees and more than 3 million customers and visitors every year, the Retailer aims to strengthen its position in Lebanon, upgrade its management to meet developing challenges and initiate regional expansion.

4.1.2 *About the module*

Merchandise Planning – MP is a newly introduced module to Retailer. Its main role is to set the merchandise budget plan, assist the buyers in knowing there open to buy- OTB, perform follow-up on set plan, and analyze the variances.

There exist many definitions for merchandise planning, but the most adapted one is: Merchandise planning is a strategic and systematic approach, aimed at maximizing return on investment, through planning and monitoring sales, margins and inventory in order to increase profitability another definition could be planning the 5 rights: right product, at the place, in the right time, with the right quantity, at the right price

The main objective of merchandise planning is to minimize markdown and stock out situations.

Over purchasing, purchasing wrong, or over pricing will force the company to do markdowns, while under purchasing will lead to stock-out situations. Any of those cases will lead to loss profit for the company.

so the main challenge of merchandise planning is finding out the balance between markdown and stock out situations.

The process of merchandise planning consists of different steps and at the end of each step a plan is set. Figure 5 shows the different plans of the merchandise planning process.

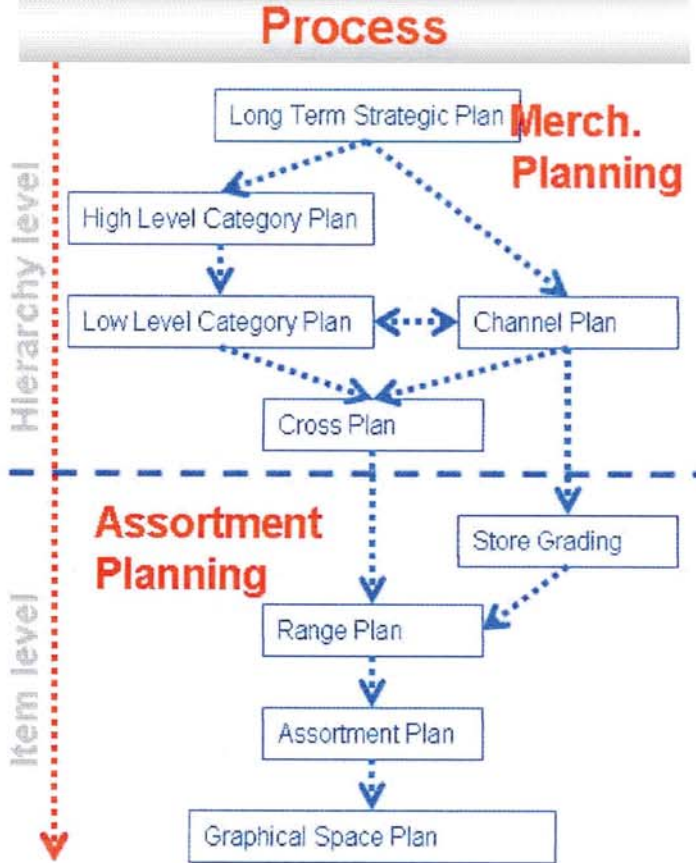


Figure 5: Merchandise Planning Process

Below is the list of steps that should be done to produce a plan. It is an iterative process:

- Seeding: copying data from history
- Normalization: reviewing data, and amending it to start the plan
- Setting objectives: what are the objectives of this plan
- Measuring performance: the use of Key Performance Indicators to measure and monitor the set objectives

The MP at Retailer will start with the basic plans, and will expand to the advanced ones at later stages. The MP module is called Arthur from JDA an international company specialized in ERP for retailers. It is an integrated module within the ERP retail system

called MMS. Since Arthur is a standard product then it contains the minimum requirements required to start with. Figure 6 shows the Arthur interface

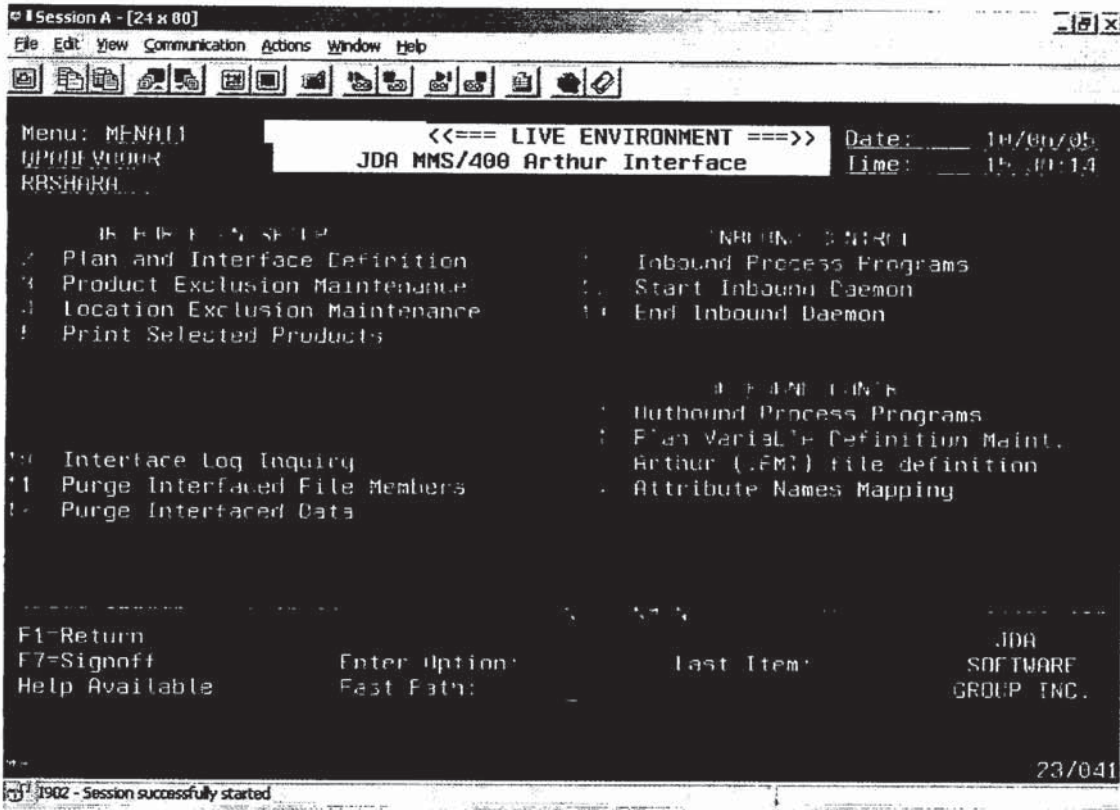


Figure 6: Arthur Interface

4.1.3 MP implementation

The ERP implementation process was planned based on the PDIA Model. The details of the plan will not be present in the thesis due to confidentiality reasons by the company at which the ERP implementation took place. However, Figure 7 shows the major tasks of the plan and Figure 8 shows some of the details of the plan.

Session A - [24 x 60] - 10/2

File Edit View Communication Actions Window Help

Menu: MENAI1 <<=== LIVE ENVIRONMENT ===>> Date: 10/06/05
QPADEV000R JDA MMS/400 Arthur Interface Time: 15:30:14
RBSHARA

ARTHUR PLAN SETUP	INBOUND CONTROL
2 Plan and Interface Definition	17 Inbound Process Programs
3 Product Exclusion Maintenance	18 Start Inbound Daemon
4 Location Exclusion Maintenance	19 End Inbound Daemon
5 Print Selected Products	
	OUTBOUND CONTROL
10 Interface Log Inquiry	23 Outbound Process Programs
11 Purge Interfaced File Members	24 Plan Variable Definition Maint.
12 Purge Interfaced Data	25 Arthur (.FMT) file definition
	26 Attribute Names Mapping

===== LIVE ENVIRONMENT =====

F1=Return JDA
F7=Signoff Enter Option: Last Item: SOFTWARE
Help Available Fast Path: GROUP INC.

1A a 23/04

1902 - Session successfully started

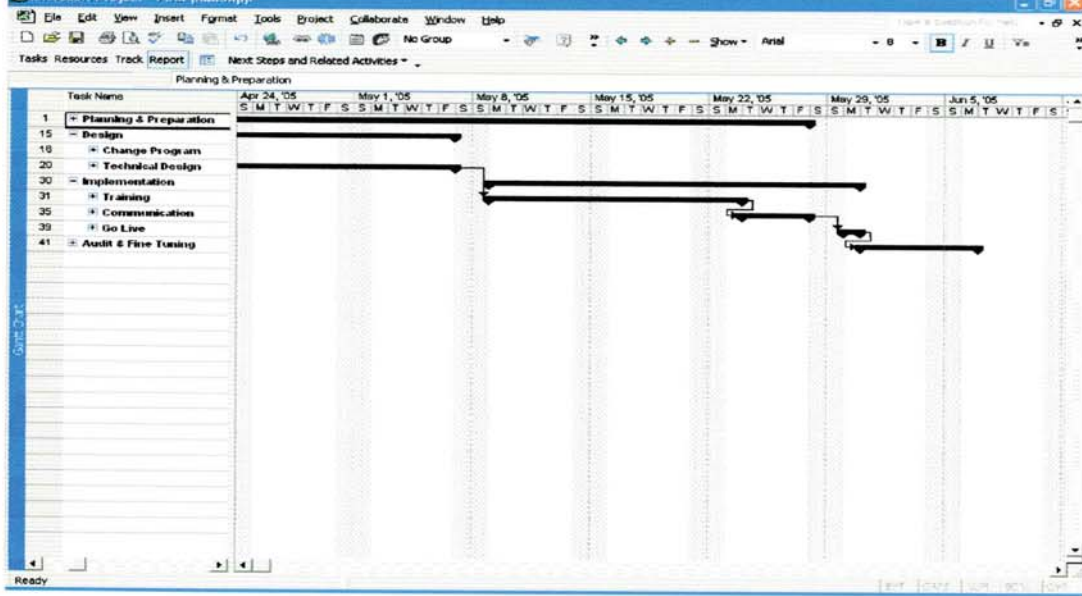


Figure 7: Major MP PDIA plan

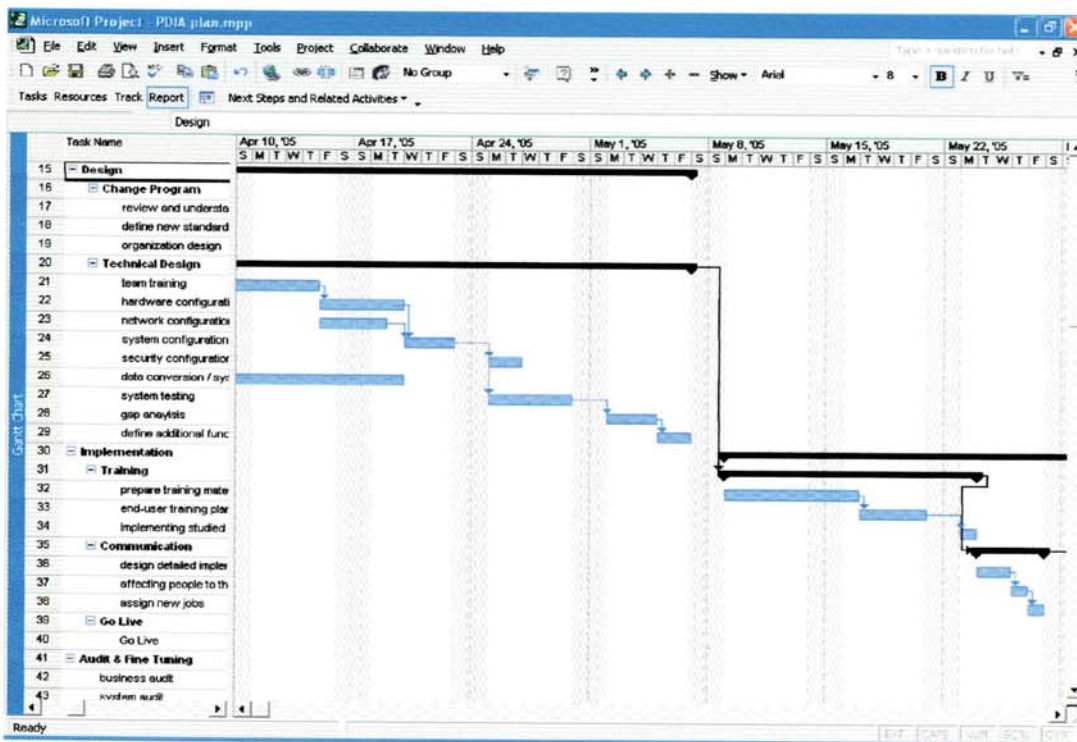


Figure 8: Detailed MP PDIA plan

The project duration was 12 weeks; it consists of 8 end-users, the 3 key-users, 4 in the functional team, 2 in the technical team, and an external consultant. The planning was done on Microsoft Project; it takes into consideration the listed tasks for all the schedules and milestones, with the estimated time. The project schedule takes into consideration the time-phase personnel needs and the resources availability for 3 months; since some of the resources were internally recruited, and some were not adequate.

The time estimate for each task was calculated from the optimistic, pessimistic, and most likely value for each task.

$$\text{Time schedule} = (\text{optimistic time} + 4 \times (\text{most likely time}) + \text{pessimistic time}) / 6$$

The budget was not taken into consideration when planning because all the resources were internal and the external consultant cost was included in the product purchase contract.

Task monitoring was done by the project manager on continuous basis, who kept on following up the different tasks. Whenever there is a constraint that might cause additional costs or procedure delays, the project manager interferes to solve the case, and might follow a contingency plan, to keep the project on time and within allocated budget.

During the implementation a focus was done on one technical aspect which is the data conversion. OLAV steps were slightly modified and adapted in the implementation process. A simulation of the particular model was done using Microsoft Access and

Microsoft Excel as tool, the code was written using VBA. This simulation shows how the data was (figure9) and how it was converted into the new system (figure10).

	A	B	C	D	E	F	G	H	I	J	K	L	M
2	# Ladies												
3	@		W	S	W	S	W	S	W	S	W	S	W
4	Sales @ Retail 05	301,015	15,843	56,843	132,634		147,289		137,233		119,761		
5	Coefficient	2.09	2.09	2.02	2.02		2.18		2.29		2.06		
6	Discount % 05	42.08%	0.42%	49.72%	0.12%		0.00%		0.00%		2.00%		
7	Net Sales 05	174,348	15,776	28,581	132,475		147,289		137,233		117,366		
8	Sales @ Cost 05	144,026	7,580	28,140	65,680		67,564		59,827		58,137		
9	Gross Profit	30,322	8,196	441	66,814		79,725		77,306		59,230		
10	GM %	17.39%	51.95%	1.54%	50.44%		54.13%		56.33%		50.47%		
11	Mark-Up %	52.15%	52.15%	50.50%	50.50%		54.13%		56.33%		51.46%		
12	Sales @ Retail 05	310,866	16,361	39,776	92,810		205,397		187,266		186,181		
13	Coefficient	2.09	2.09	2.02	2.02		2.18		2.29		2.06		
14	Discount % 05	42.08%	0.42%	49.72%	0.12%		0.00%		0.00%		2.00%		
15	Net Sales 05	180,054	16,293	19,989	92,699		205,397		187,266		192,257		
16	Sales @ Cost 05	148,740	7,828	19,691	45,946		94,219		81,776		95,233		
17	Gross Profit	31,314	8,464	306	46,753		111,178		105,490		97,024		
18	GM %	17.39%	51.95%	1.54%	50.44%		54.13%		56.33%		50.47%		
19	Mark-Up %	52.15%	52.15%	50.50%	50.50%		54.13%		56.33%		51.46%		
20	Sales @ Retail 05	59,449	3,129	13,640	31,827		41,517		45,247		34,431		
21	Coefficient	2.09	2.09	2.02	2.02		2.18		2.29		2.06		
22	Discount % 05	42.08%	0.42%	49.72%	0.12%		0.00%		0.00%		2.00%		
23	Net Sales 05	34,433	3,116	6,858	31,789		41,517		45,247		33,742		
24	Sales @ Cost 05	28,444	1,497	6,752	15,756		19,045		19,759		16,714		
25	Gross Profit	5,988	1,619	106	16,033		22,473		25,488		17,028		
26	GM %	17.39%	51.95%	1.54%	50.44%		54.13%		56.33%		50.47%		
27	Mark-Up %	52.15%	52.15%	50.50%	50.50%		54.13%		56.33%		51.46%		
28	Sales @ Retail 05	8,399	447	1,485	3,464		4,268		3,898		4,439		

Figure 9: Old system data

		Channel Plan							
Location	Data	Version	Month				YTD		
			Winter	Summer	All-season	Total	Winter	Summer	All-season
Department 01, Ladies		Actual LY	\$3,981	\$158,858	\$0	\$162,840	\$326,321	\$414,980	\$0
Period May/05		Plan	\$0	\$187,266	\$0	\$187,266	\$350,642	\$501,834	\$0
Location 1	Gross Sales \$*	Actual TY	\$845	\$210,135	\$0	\$210,983	\$210,915	\$480,959	\$0
		Var to LY	-79%	32%	-	30%	-36%	16%	-
		Var to PL	-	12%	-	13%	-40%	-4%	-
		Actual LY	\$10	\$119,323	\$0	\$119,333	\$318,757	\$368,573	\$130
Location 2	Gross Sales \$*	Plan	\$0	\$137,233	\$0	\$137,233	\$357,858	\$432,999	\$0
		Actual TY	\$25	\$141,660	\$0	\$141,685	\$195,325	\$376,095	\$0
		Var to LY	155%	19%	-	19%	-39%	2%	-100%
		Var to PL	-	3%	-	3%	-45%	-13%	-
Location 3	Gross Sales \$*	Actual LY	\$145	\$39,199	\$0	\$39,345	\$67,790	\$101,180	\$200
		Plan	\$0	\$45,247	\$0	\$45,247	\$73,089	\$121,720	\$0
		Actual TY	\$0	\$37,779	\$0	\$37,779	\$45,335	\$108,630	\$0
		Var to LY	-100%	-4%	-	-4%	-33%	7%	-100%
Preliminary	Plan	Actual LY	\$0	\$3,392	\$0	\$3,392	\$9,853	\$9,256	\$0
		Plan	\$0	\$3,898	\$0	\$3,898	\$9,884	\$12,070	\$0

Figure 10: Data converted to new system

The old system is represented as an Excel sheet, while the new system is another Excel sheet that uses macros and ODBC connection to retrieve the data from the old system (please refer to appendix A for code details) stores it in an access table and then loads it from access to excel as the new system. The access data base will store data of both the old and the new system. A log table is set to log the data conversion values, its fields are shown in figure 11.

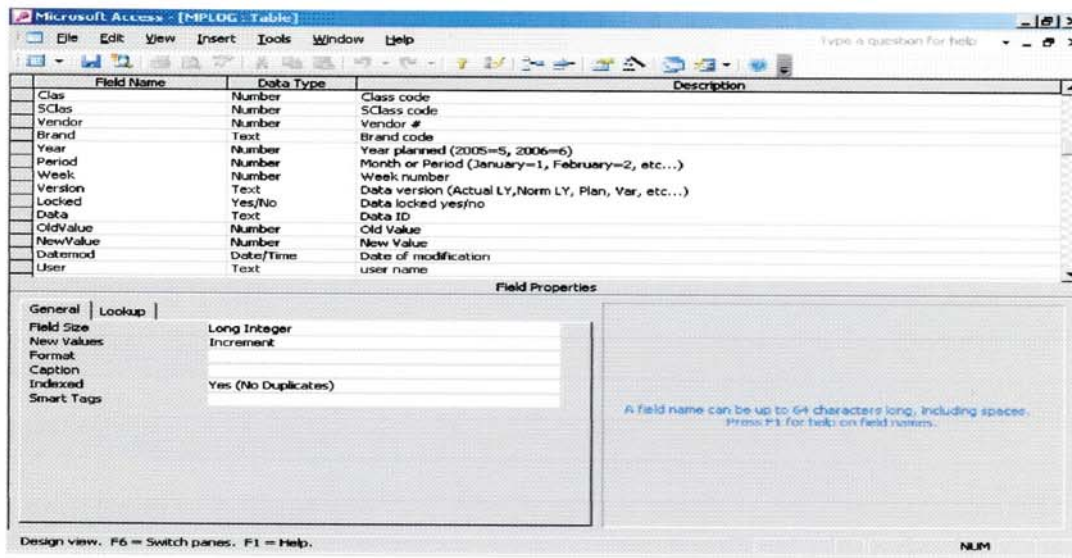


Figure 11: Log table fields

4.1.4 MP evaluation

After the implementation tasks were completed, an evaluation for the project was done using the PDIA evaluation model. Ideally the evaluation should be done after a certain period and not directly when the project ends. Due to time constrains the evaluation was done one week after the go live, leading to taking some assumptions while performing the task. To complete this task some statistics were required to be able to evaluate the implemented module in a scientific way and try not to do it in a subjective way. The statistics were done using Microsoft Excel, due to its power in process and calculating numbers, as well as its wide variety of presenting the data graphically.

The MP evaluation using the PDIA evaluation model was done for all the critical success factors. Table 12 shows the scoring for each critical success factor:

#	Critical success factor	Frequency of occurrence in literature	Weight	PDIA Part	Score	Total	Full score
1	Top management and project sponsor commitment and support	16	10.60%	1	2	0.21	0.32
2	Business process reengineering	16	10.60%	2	2	0.21	0.32
3	Use of project management to manage implementation	15	9.93%	1	2	0.20	0.30
4	Change management culture and program	14	9.27%	1	3	0.28	0.28
5	Measurable objectives	13	8.61%	1	1	0.09	0.26
6	Selecting the right team (competence)	12	7.95%	1	2	0.16	0.24
7	User training and education	9	5.96%	3	2	0.12	0.18
8	Effective communication	9	5.96%	1	3	0.18	0.18
9	Added value of ERP consultants	8	5.30%	2	2	0.11	0.16
10	User participation	5	3.31%	2	3	0.10	0.10
11	Configuration and integration of the system adapted to business needs	5	3.31%	2	3	0.10	0.10
12	Project driven by business needs or appropriate management expectation	4	2.65%	1	3	0.08	0.08
13	Assess project risks and define contingency plan	3	1.99%	1	3	0.06	0.06
14	Motivation of all team members	3	1.99%	3	2	0.04	0.06
15	Documentation of business and technical parts of the project	3	1.99%	2	2	0.04	0.06
16	Software testing and troubleshooting	3	1.99%	2	2	0.04	0.06
17	Plan monitoring, follow-up and evaluation of performance	2	1.32%	4	3	0.04	0.04
18	Align budget to objectives	2	1.32%	1	3	0.04	0.04
19	System security	2	1.32%	2	3	0.04	0.04
20	Pertinence of training to technical team	2	1.32%	2	2	0.03	0.04
21	Distribution of workload	1	0.66%	1	1	0.01	0.02
22	Continuous enhancement	1	0.66%	4	2	0.01	0.02
23	Adequate control	1	0.66%	4	2	0.01	0.02
24	Continuous control on budget	1	0.66%	4	3	0.02	0.02
25	Data conversion	1	0.66%	2	3	0.02	0.02
	Total	151	100.00%		59	2.23	3.00

Table 12: MP implementation scoring using PDIA model

The top management, project sponsor, and steering committee commitment and support scored 2 as shown in figure 12

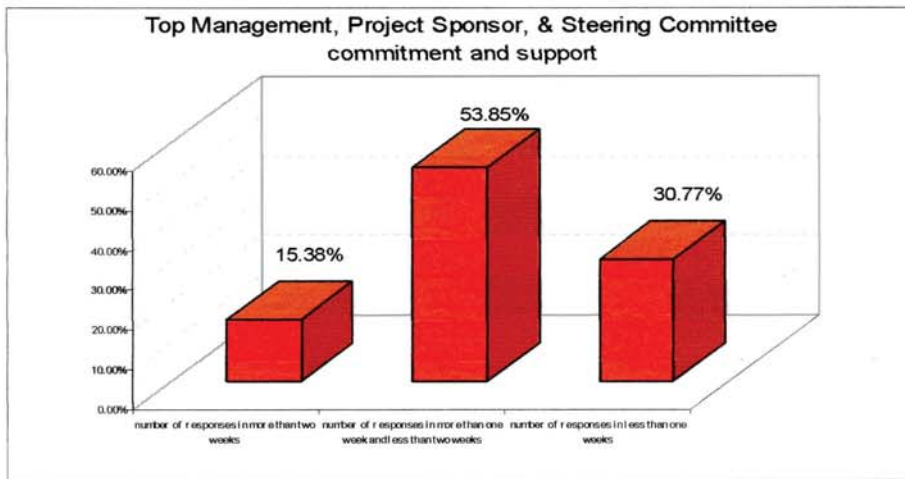


Figure 12: Top management, project sponsor, and steering committee commitment and support for MP

The business process reengineering factor scored 2. The existing constraints and the best practices were studied, in addition the documentation was done but not final by the time the evaluation was conducted, which gave it a score of 2.

Use of project management to manage implementation scored 2. The plan was delayed due to some resources who were not adequate to perform some tasks which caused few amendments to the plan.

The change management culture and program scored 3, based on the results in figure 13.

The low rate of resistance to change was mainly due to the fact that this is the second implementation process for an ERP module at Retailer

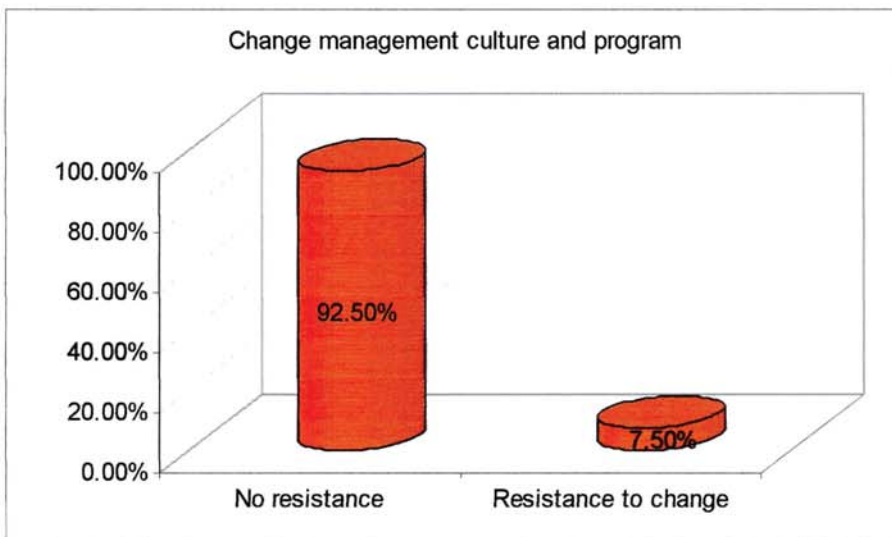


Figure 13: Change management culture and program for MP

A score of 1 was given to the measurable objectives because the entire project objectives can not be measured, no valued target was set. The main objective was to have better

visibility on merchandise budget and know where to purchase from, or to where to spend more.

Selecting the right team scored 2 because plan was delayed due to some members, who were not adequate to the position, since they were recruited internally to save money. Some of the tasks required advanced knowledge which was not found in such members. User training and education was evaluated with a score of 2. Having the number of users (8 users), the number of requests recorded for the first week (36 requests), then the average of requests per user is computed (4.5 request / user). Ideally the average should be less than 5 but since it is the first week after the go live then it is normal to get high values.

A score of 3 was given to effective communication, based on a questionnaire distributed to 40 involved parties either directly or indirectly. Ideally it should be 100% but the results appear in figure 14.

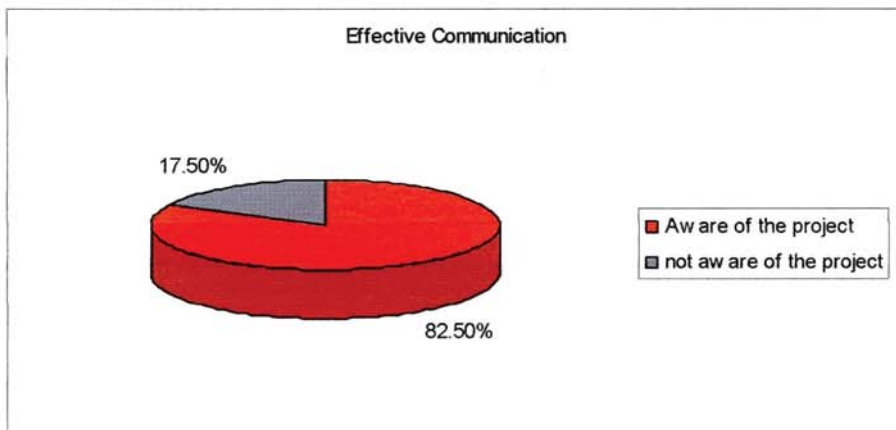


Figure 14: Effective communication for MP

Added value of ERP consultants scored 2, because the impact of the consultant was more in the technical side of the project than in the functional. The ERP technical consultancy was chosen by the company to save money.

User participation, there were 3 main key users who attended all the meeting and validated the functional decisions. Thus the user participation was given a score of 3. Configuration and integration of the system adapted to business needs got a score of 3, since no business process changes were done to meet with the system configuration, mainly because the system is of international standards and only the basic things were configured to start with.

Project driven by business needs or appropriate management expectation scored 3, because all business procedures were provided to the technical team to adapt the system to them.

Assess project risks and define contingency plan scored 3, because there exist only one risk. The risk was project delay and not being ready one week before June, for which a contingency was set to it which was using the old excel system in order not to block the system.

Motivation of all team members scored 2, since some resources had to be involved in some technical aspects which they lack, thus causing to those members a kind of demotivation which was solved by amendments to the tasks.

Documentation of business and technical parts of the project scored 2. However, the documentation was done but they were not updated because of the time the evaluation was done.

Software testing and troubleshooting scored 2, for the reason that two minor bugs that do not block the system were discovered by the users but have workarounds.

A score of 3 was given to monitoring, follow-up, and evaluation of performance of the plan. This score was given because a weekly follow-up meeting was done for the project, and a daily follow-up was done by the team manager for the tasks.

Align budget to objectives, scored 3. Since no clear return on investment – ROI and no obvious objectives were set, the score should be 1. But knowing that the company have a good deal with the MP module supplier due to long term relationship with them, and knowing that the expected output with respect to the set budget will be high then the score is assumed to be 3.

All the security system was applied, resulting in a score of 3.

Pertinence of training to technical team scored 2, as shown in figure15. This score is mainly due to fact that the evaluation is done after one week from the go live, and the module is small and requires few efforts from the supplier to provide help specially that they are available on the site.

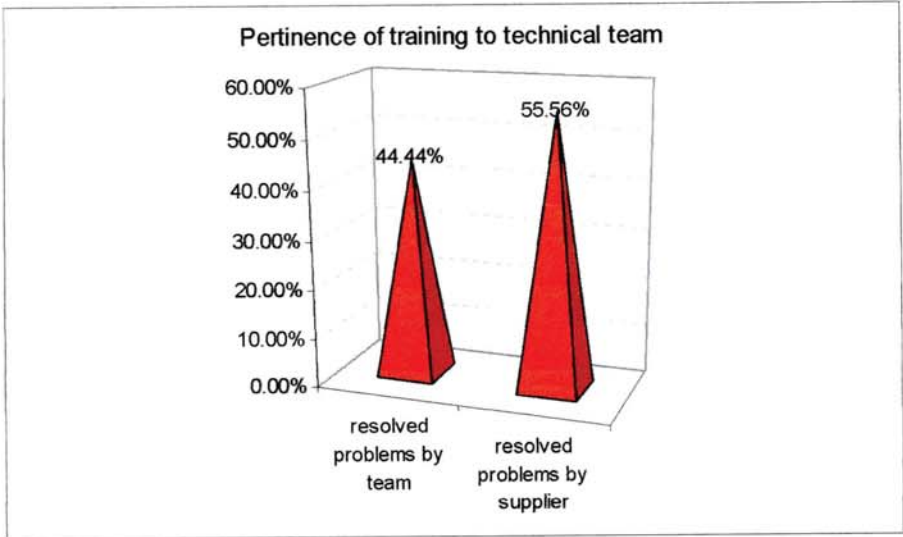


Figure 15: Pertinence of training to technical team for MP

Distribution of work load scored a 1. This low score is considered bad because some members were not adequate and caused delay which forced others to work overtime to cover the delay. Figure 16 shows that due to delays, some members became overloaded (6 members) while others not (4 members).

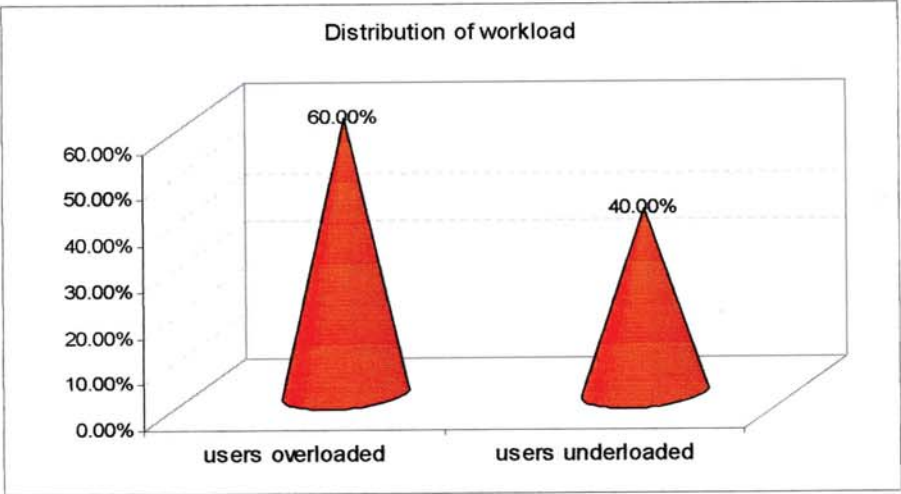


Figure 16: Distribution of workload for MP

Continuous enhancement score was set to 2 because it is too early to evaluate such a factor, so it was estimated to become high although no system currently exists. However the idea of such a system exists.

Same evaluation was done for adequate control, which was given an estimated score of 2. It is too early to evaluate such a system, and keeping in mind that the idea of such a system exists, based on these the score was set.

Continuous control on budget scored 3, because no additional charges were added to the budget.

Data conversion scored 3, for the reason that all converted data was properly present in the new system

The total score was 59(sum of all scores) out of 75(sum of ideal scores) which is equivalent to 78.66%. Figure 17 shows the MP score versus the PDIA ideal score. The red curve indicates the score for the identified critical success factor while the blue curve indicates the top score for each critical success factor

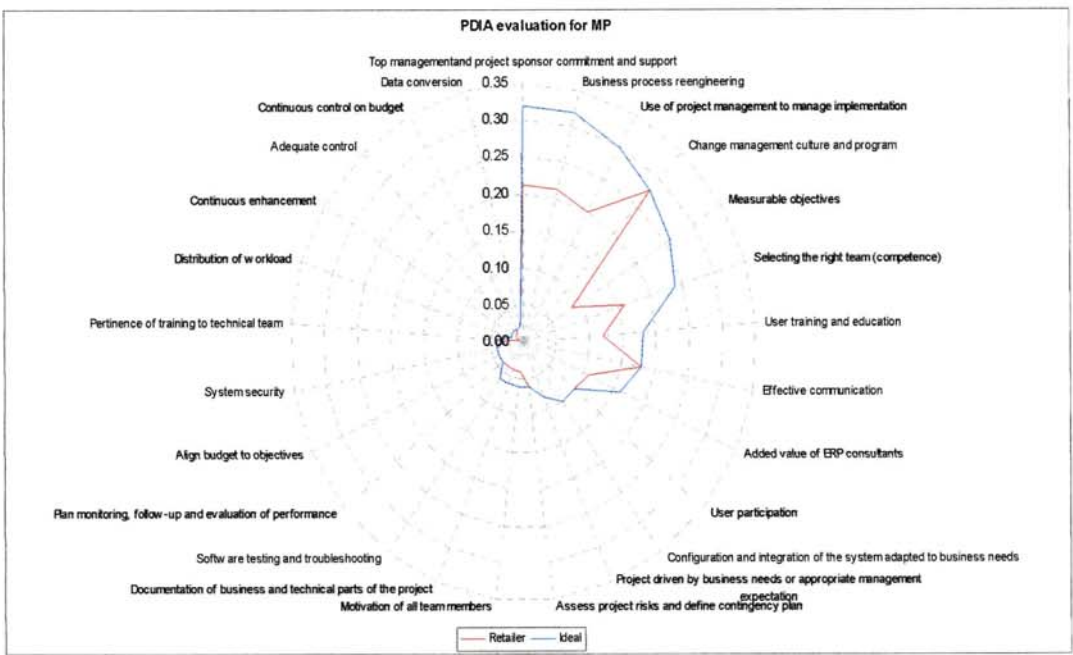


Figure 17: DPIA evaluation for MP

Figure 18 shows the score of the MP for the four main PDIA parts with respect to the ideal score by part. The red curve indicates the score of the MP for each of the PDIA parts, while the blue curve specifies the top scoring for each part of the PDIA.

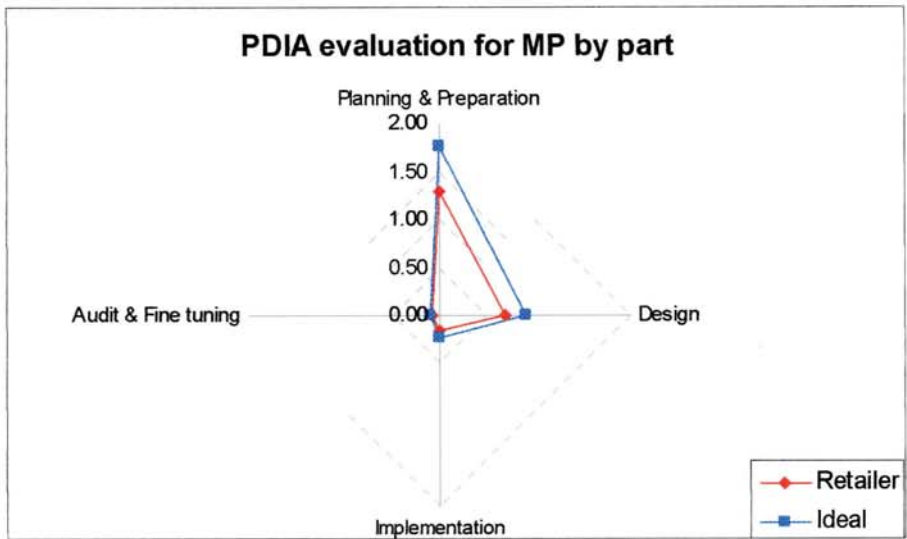


Figure 18: PDIA evaluation for MP parts

The PDIA evaluation model identifies that an implementation is successful if the total score is greater than 2 which is equivalent to 66.66% (calculated from the division of 2 over the ideal score which is 3). Hence MP implementation using the PDIA model was successful since it scored 2.23 which is equivalent to 78.66%

4.1.5 Comparison to other ERP modules within the firm and with other firm

4.1.5.1 Module within the firm

The module to be compared to MP is the merchandise management module. It mainly covers all the product life cycle. It is a foreign ERP called MMS which stands for Merchandise Management System bought through the local consultant called Quantech.

The implementation was divided into the following parts:

- Project initiation: which covered mainly all the tasks of the PDIA part one arriving to the kick-off meeting in which an event was held to launch the project.
- Business process re-engineering: it covered analyzing the as is situation and the to be situation by adapting the business requirements to the ERP system
- Technical installation: it ran in parallel with the analysis phase. It mainly covered the hardware, network, and system installations.
- Configuration: the module is configured based on the agreed functions in the BPR phase
- Data conversion: it was done from a Cobol under UNIX system to DB2 under AS400, and no problems were identified during the data conversion process

- Testing: it was done using test scripts send to the key-users
- Training: it was done by the key users and was running in parallel with the configuration and data conversion
- Go Live: was not delayed
- Maintenance and continuous enhancement: back up is done on daily basis, support online for the MMS and through site visits for the hardware

4.1.5.2 Module within another firm

All the data below was collected from an interview with the IT manager at Retailer2.

Please refer to appendix B for the guidelines of the interview.

The main reasons to move to ERP where that the existing system consisted of one server with limited capacity and linked to the clients through a local area network, which is a time consuming process. With the increase of the number of transactions the need for a new system became a must

The selection process of the ERP:

- It took around six months
- Contacts were done with foreign and local suppliers
- All department managers and general managers were involved in the product selection

A local ERP was selected form Computec-R-MACC, although it did not meet the requirements but an agreement was done for modifications.

The product license was for 50 users, and it covers the following modules:

- Accounting

- Stock management
- Account receivable
- Account payable
- HR
- Payroll
- CRM (wedding list, gift voucher, bonus system)

The implementation was divided into the following parts:

- Technical installation: it took two months and both Computec and Retailer2 were involved in this part. It mainly covered the hardware, and network installations. A main server was installed at a branch (Jal el Dib) and linked to all branches through a leased line
- Analysis: it took six months, and involved the director of each department with several key users. They worked as part time during the analysis period and with in the same number of working hours (no over time). Each module was analyzed separately
- Configuration: after the analysis of each module, it was configured
- Training: it took six months and was done in parallel with the analysis. Exhaustive and intensive training were provided to end users due to time constraints, which was the opening of a new store in Down Town in May 2004. During this period the directors and employees were meeting once per a week to discuss problems and tasks to be optimized. If the problem requires modifications

a report was submitted to the director of Computec in order to communicate and resolve problems

- Test and simulation: it took seven months in parallel with the analysis and training, due to the important level of modifications done to the original program.
- Data conversion: it took one month, and no problems were identified during the data conversion process
- Go Live: was as decided in May 2001
- Maintenance and continuous enhancement: back up is done on daily basis, support by Computec is done online or through e-mails or through site visits depending on the urgency of the problem

In 2003 the management committee has recruited an internal consultant in order to take adequate strategic decisions, because the director travels a lot.

The consultant required a detailed implementation documentation of R-MACC, for the analysis, functions, procedures, and training manuals.

The consultant required some modifications to the system; they were mainly fine tuning reports formatting, and addition of some statistics by hour

Since the end of 2004 Retailer2 has noticed a better quality in the system, and transactions are managed easier than previously for example:

- discount by product and not on the total invoice
- issuing an invoice in LBP and collection in USD
- maintain an updated stock

- possibility for a client to buy in one branch and to pay in another branch
- security was enhanced and each client has a unique code and can not be voided
- the staff is motivated due to simplification of tasks and possibility to preview problems and have better expectations

During 2004 they modified the stock management to have better receiving.

In order for employees to be able to use the system properly, Retailer2 School offers to each recruited person training on R-MACC assisted by the director of the department

4.1.5.3 Comparison between modules implementation

A comparison was done for another implemented module within the firm, and with another Lebanese retail company which has implemented an ERP, in which the main differences were highlighted.

To evaluate and compare the three modules MP, MMS, and R-MACC is a huge task which requires some statistics to remove the subjectivity from the scoring. Knowing that the statistics of MMS and R-MACC can not be reached, the comparative evaluation will be based on either the presence or absence of the critical success factors (0 if not available or 1 if available). Table 13 shows the comparative results of the different modules, the grey cells indicates the absence of the factor in the implementation process. R-MACC implementation lacked the added value of ERP consultants since when it was over the consultant was hired. In addition the documentation was not done during the implementation of R-MACC. Concerning MMS implementation it was driven by the

system and not by the business needs, because the business requirements were adapted to the system. The R-MACC and MMS missing factors were done in later stages.

#	Critical success factor	MP	MMS	R-MACC
1	Top management and project sponsor commitment and support	1	1	1
2	Business process reengineering	1	1	1
3	Use of project management to manage implementation	1	1	1
4	Change management culture and program	1	1	1
5	Measurable objectives	1	1	1
6	Selecting the right team (competence)	1	1	1
7	User training and education	1	1	1
8	Effective communication	1	1	1
9	Added value of ERP consultants	1	1	0
10	User participation	1	1	1
11	Configuration and integration of the system adapted to business	1	1	1
12	Project driven by business needs or appropriate management	1	0	1
13	Assess project risks and define contingency plan	1	1	1
14	Motivation of all team members	1	1	1
15	Documentation of business and technical parts of the project	1	1	0
16	Software testing and troubleshooting	1	1	1
17	Plan monitoring, follow-up and evaluation of performance	1	1	1
18	Align budget to objectives	1	1	1
19	System security	1	1	1
20	Pertinence of training to technical team	1	1	1
21	Distribution of workload	1	1	1
22	Continuous enhancement	1	1	1
23	Adequate control	1	1	1
24	Continuous control on budget	1	1	1
25	Data conversion	1	1	1

Table 13: Comparison between modules

CHAPTER 5: CONCLUSIONS

5.1 SUMMARY OF THE MAIN RESULTS

With the increasing complexity and sophistication of today's ERP systems the use of a formal implementation methodology is a critical success factor for the project. In brief the thesis study reviews the existing ERP implementation methods, and proposes a new ERP implementation model called PDIA, which is divided into four main parts (planning and preparation, design, implementation, and audit and fine tuning). These four main parts are in their turn sub-divided into sub-parts. The parts and sub-parts consist of a set of major tasks. The major tasks overview is present in the thesis with a focus on a technical aspect which is data conversion. The PDIA task matrix shows the major tasks with the responsible person, the input, the output, and the milestone for each task in the form of a matrix divided into the above mentioned parts. The critical success factors are derived from the details of the major tasks. Some of these critical success factors are general while others are particular. Moreover, a new evaluation model for the PDIA model is introduced, to assess the implementation. Both the PDIA model and its evaluation model were tested on an ERP module, to check their efficiency. A small comparison is done to other implemented modules one within the same firm and one with another firm. The following parts will explain the weaknesses and strengths of the study.

5.2 GENERALIZABILITY OF THE THESIS

The thesis study is a general study on the ERP implementation methods, the proposed PDIA model is general in its turn since its main parts, sub-parts, and tasks were derived from the general implementation methods identified. The model was used in the implementation process of an international ERP system (in the practical case, please refer to chapter 4 of the thesis for further details about the practical case). Since the ERP system and the methods on which the model was based are general, the proposed model is generalizable. The evaluation model is subjective in general, but certain measures were set to transform it from being subjective to approach objectivity. Also it was used to evaluate the PDIA implementation process on an international ERP system (please refer to chapter 4 for further details). The evaluation model in its turn is generalizable too.

5.3 MAIN CONTRIBUTIONS OF THE THESIS

The main contributions of the thesis were the design of a new ERP implementation model the PDIA model with its evaluation model. The PDIA tasks matrix that shows the major tasks in each part, with the responsible person, the input, the output, and the milestone of each task. A detailed focus was done on one technical aspect of the implementation process which is the data conversion. From the major tasks a list of the critical success factors was identified. The identified list of critical success factors was used in setting the evaluation model.

Based on the PDIA model a practical implementation was done with a focus on the data conversion technical aspect and a simulation showing the steps of the data conversion

process. The PDIA evaluation model was tested on the implemented module, showing the implementation success.

5.4 POSSIBLE EXTENSIONS AND FUTURE WORK

Time was an important factor to be considered in the thesis study. If more time was available:

- It would have been more efficient to look for additional and newly introduced – if any – ERP implementation methods that might present new tasks into the model
- It would have been more general to test the PDIA model on more ERP modules rather than one, keeping in mind that the ERP implementation process might last for years
- It would have been better to set a scientific way to be able to set the scores while evaluating the implementation process. Thus develop an evaluation software for ERP implementation methods, in which the score for each task is calculated by the software based on defined scientific methods
- It would have been better if the evaluation for the implemented module was done after a longer period of time and not just one week after the go live
- It would have been better to study the details of the data conversion in more depth by looking into the different ERP data conversion methods that exist
- It would have been better to cover the technical details of ERP for the software and the hardware like database, architecture, components, etc.

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APPENDIX

APPENDIX A

```
Public Sub SaveFollowUP()
Dim wrkODBC3 As Workspace
Dim conMP3 As Connection
Dim strSQL3 As String
Dim qdfSQL3 As QueryDef
Dim rstPlan3 As Recordset
Dim Value As Double
Dim crit As String
Dim rstResult As Recordset
Dim c As Variant
Dim Idm, ids
On Error GoTo Err_SaveFollowUp
    loading = False
    oldStatusBar = Application.DisplayStatusBar
    Application.DisplayStatusBar = True
    Application.StatusBar = "Saving Follow Up in progress...please wait"
    Idm = 0: ids = 0: store = -1: dept = -1
    Application.GoTo ActiveSheet.Range("A1")
    For Each c In ActiveSheet.UsedRange
        Application.StatusBar = "Saving Follow Up in progress :" & c.Address
        DoEvents
        If Cells(c.row, 1).Value = "#" Then Idm = c.row
```

```
If Cells(c.row, 1).Value = "@" Then ids = c.row  
If Idm = 0 Or ids = 0 Then GoTo nextc  
Select Case Cells(c.row, 1).Value  
Case "Dbayeh": store = 2  
Case "Ach.": store = 11  
Case "Branches": store = 55  
Case "Furn El Chebbak": store = 8  
Case "Total": store = 0  
Case Else:  
End Select  
Select Case Trim(Cells(Idm, 2).Value)  
Case "Ladies": dept = 1  
Case "Men": dept = 2  
Case "Y&F": dept = 15  
Case "Toys": dept = 12  
Case "Ling.": dept = 9  
Case "Lad. Sh.": dept = 7  
Case "Ch. Sh.": dept = 16  
Case "Child.": dept = 3  
Case "Acc.": dept = 6  
Case "H.H.": dept = 4  
Case "L.D.M.": dept = 5  
Case "Xmas-Easter": dept = 10
```

```
Case "E.M.": dept = 11
Case "Decoration": dept = 8
Case "Cosmetics": dept = 18
Case Else:
    dept = -1
End Select

Select Case Cells(Idm, c.Column).Value
Case "Feb": month = 502
Case "Mar": month = 503
Case "Apr": month = 504
Case "May": month = 505
Case "Jun": month = 506
Case "Jul": month = 507
Case "Aug": month = 508
Case "Sep": month = 509
Case "Oct": month = 510
Case "Nov": month = 511
Case "Dec": month = 512
Case "Jan": month = 601
Case "Total": month = 0
Case Else:
    End Select

Select Case Cells(ids, c.Column).Value
```

```

Case "S": season = "SU"
Case "W": season = "WI"
Case "T": season = "AS"
Case Else:
    season = ""
End Select

Select Case Cells(c.row, 2).Value
Case "Sales @ Retail 05": Data = "Gross Sales $"
Case "Discount % 05": Data = "POM MD$"
Case "Sales @ Cost 05": Data = "COGS (month)"
Case "Purchases @ Cost 05": Data = "Purchases @ Cost$"
Case "Purchases @ Retail 05": Data = "Purchases @ retail$"
Case "Stock status @ Retail 05": Data = "CB retail$"
Case "Stock status @ Cost 05": Data = "CB Cost$"
Case Else:
    Data = ""
End Select

If store >= 0 And month >= 0 And dept > 0 And season <> "" And Data <> "" Then
    Set wrkODBC3 = CreateWorkspace("NewODBCWorkspace", "admin", "",
dbUseODBC)
    Set conMP3 = wrkODBC3.OpenConnection("Connection3", , ,
"ODBC;DATABASE=MP;DSN=MP")
    DoEvents

```

```

strSQL3 = "SELECT COUNT(*) AS CNT FROM FU"
crit = " WHERE DEPARTMENT=" & dept
crit = crit & " AND VERSION=" & version & ""
crit = crit & " AND SEASON=" & season & ""
crit = crit & " AND PERIOD=" & month
crit = crit & " AND LOCATION=" & store
strSQL3 = strSQL3 & crit
Set qdfQry = conMP3.CreateQueryDef("")
With qdfQry
    .Sql = strSQL3
    Set rstQry = .OpenRecordset()
End With
Call ExecuteQuery(strSQL3)
    If rstQry!CNT = 0 Then
        strSQL3 = "INSERT INTO FU ( VERSION, DEPARTMENT, PERIOD,
LOCATION, SEASON,[ " & Data & "]) VALUES "
        strSQL3 = strSQL3 & "(" & version & "," & dept & "," & month & "," & store
& "," & season & ""
        strSQL3 = strSQL3 & "," & CDb(c.Value) & ");"
        Call ExecuteQuery(strSQL3)
    Else
        strSQL3 = "UPDATE FU SET [ " & Data & "]= " & CDb(c.Value)
        crit = " WHERE DEPARTMENT=" & dept

```

```

        crit = crit & " AND VERSION='" & version & "'"
        crit = crit & " AND SEASON='" & season & "'"
        crit = crit & " AND PERIOD='" & month
        crit = crit & " AND LOCATION='" & store
        strSQL3 = strSQL3 & crit
        Call ExecuteQuery(strSQL3)
    End If

    conMP3.Close

    wrkODBC3.Close

Else

    End If

nextc:

Next c

    Call MsgBox("Save operation Succeeded", vbOKOnly, "ABC Merchandie Planning")

Application.StatusBar = False

Application.DisplayStatusBar = oldStatusBar

Exit Sub

Err_SaveFollowUp:

If DBEngine.Errors.Count > 0 Then

    For Each errLoop In DBEngine.Errors

        MsgBox "SQL:" & strSQL3 & Chr(10) & " Error number: " & errLoop.Number &
vbCr & errLoop.Description

    Next errLoop

```

End If

Application.StatusBar = False

Application.DisplayStatusBar = oldStatusBar

Exit Sub

End Sub

APPENDIX B

What was the reason to move to ERP?

- Business
- System

What was done to select the ERP?

- Request for proposal
- Time

Can you briefly describe the selected ERP?

- Vendor
- Product

What were the main implementation steps used to implement the ERP? Can you explain them in details?

- Preparation and planning
- Design (change program and technical design)
- Implementation (training, communication, and go live)
- Audit and fine tuning

What is the status of the ERP implementation? Any continuous enhancement plans?

- Level of support
- New modifications
- New requests