

**DEVELOPING AN ENTERPRISE RESOURCE PLANNING PROJECT
MANAGEMENT ROADMAP: CROSS-COUNTRY COMPARISON TURKEY
VERSUS FINLAND**

**A THESIS SUBMITTED TO THE GRADUATE SCHOOL OF NATURAL
AND APPLIED SCIENCES OF ATILIM UNIVERSITY**

BY

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DEGREE OF MASTER OF SCIENCE IN INDUSTRIAL ENGINEERING**

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Approval of the Graduate School of Natural and Applied Sciences, Atılım University.

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ABSTRACT

DEVELOPING AN ENTERPRISE RESOURCE PLANNING PROJECT MANAGEMENT ROADMAP: CROSS-COUNTRY COMPARISON TURKEY VERSUS FINLAND

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Enterprise Resource Planning programmes are most commonly used business transaction systems for monitoring, controlling and directing the business. The setup costs of these programmes are high, a proper methodology should be followed during the implementation process. Our main assumption is that although there are certain methodologies presented in the literature, due to the differences between business making styles between countries, the implementation success ratios differ from each other. In the literature review, the concepts like ERP, project management and national differences in business making concepts are investigated. A cross-country survey is conducted between Finland and Turkey, in order to determine the regional difference in critical success factors, expenses and sight of view in ERP project management. After the analyses of the results, outcomes are discussed in the end of the survey. The results of this study is expected to provide innovative and supportive perspective for future ERP implementations.

Keywords—Enterprise Resource Planning, project management, national difference, roadmap.

ÖZ
KURUMSAL KAYNAK PLANLAMA PROJE YÖNETİMİ HARİTASI
OLUŞTURMAK: TÜRKİYE VE FİNLANDİYA VERİLERİYLE
ÜLKELERARASI KIYASLAMA

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Kurumsal Kaynak Planlama programları günümüzde firmaların hareketlerini görüntülemek, kontrol etmek ve yönetmek için kullanılan en yaygın iş akışı sistemleridir. Maliyeti çok yüksek olduğu için, bu programların doğru bir metodoloji kullanılarak kurulumu yapılmalıdır. Temel varsayımımız literatürde çeşitli yöntemler sunulmasına karşın, ülkeler arasındaki iş yapış farklarına bağlı olarak, kurulum başarı oranlarının değişiklik göstermesidir. Literatür tarama kısmında Kurumsal Kaynak Planlama, proje yönetimi ve iş yapış tarzlarındaki kültürel farklar araştırılmıştır. Kritik başarı faktörleri, harcamalar ve Kurumsal Kaynak Planlama proje yönetimlerine bakış açılarının bölgesel farklılıklarını gözlemlemek açısından, Türkiye’de ve Finlandiya’da anket çalışması yapılmıştır. Sonuçların analizinden sonra çıktılar çalışmanın sonunda tartışılmıştır. Bu çalışmanın sonuçlarının gelecekteki Kurumsal Kaynak Planlama kurumlarında yenilikçi ve destekleyici bir bakış açısı katması beklenmektedir.

Anahtar Kelimeler –Kurumsal Kaynak Planlama, ERP, proje yönetimi, kültürel fark, Harita

To My Family and Friends

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LIST OF ABBREVIATIONS

ERP - Enterprise Resource Planning
ASAP - Accelerated SAP
CRM - Customer Relationship Management
SM – Strategic Management
BPR – Business Process Reengineering
ISO - International Organization for Standardization
KPI –Key Performance Indicators
CSF – Critical Success Factor
UAI – Uncertainty Avoidance Index
LSMW- Legacy System Migration Tool
SCATT- SAP Control Aided Testing Tool

CHAPTER 1

INTRODUCTION

Systems are generally defined as combination of functionally related elements or parts forming single whole working coordinated and collaborated for same purpose or to reach same goal.[1] People set up systems in order to coordinate the internal resources efficiently to improve their current state.

Being organized is generally a necessity for a system to be controlled, monitored and directed correctly. There are several assisting tools to conduct this procedure. Transactions can be kept manually or certain programs can be used. For most of the companies, Enterprise Resource Planning (ERP) systems are aimed to be a tool to help people conduct their functions. High rate of failure in ERP projects is an evidence of ineffective project management and goal setting.

In this thesis the main assumption is providing a good scope which is supported by good project management will lead the implementation to success. For better understanding literature study is conducted in which there is definition, advantages and success ratio of ERP projects followed by a project management definition. In addition to that, there will be information about Hofstede's methodology for comparing business making styles of different cultures and theoretical knowledge about Umble's 10 Critical Success Factors [2] and Balanced scorecard[3] which are expected to be useful for our study is provided. Furthermore Accelerated SAP (ASAP) methodology, which is presented as implementation strategy of SAP, is also assured in the study.

In order to clarify and define the path to follow, a survey is conducted in companies from Turkey and Finland. 2 countries are chosen due to their success difference on ERP implementations. Afterwards, considering the survey results and analyses which are gathered from Turkish and Finnish companies, the cross country comparison is conducted in order to state the difference in terms of scope, perspective and priority

before, during and after implementation. With respect to this research result providing an ideal methodology for ERP implementation is aimed.

CHAPTER 2

BACKGROUND OF THE STUDY

2.1 Definition of ERP

ERP is systemized software that helps grouping, distributing and monitoring the missions, tools and goals in a business in terms of departments. All entities and transactions in the system are visible and stored in a certain central database[4]. ERP software packages are too expensive to buy, several times as much to implement, and constrain corruptive organizational change[5].

Although it is hard to implement and advantages of ERP can be listed as:

- Flexibility
- Scalability
- Integration
- Decreasing the cost
- Ease of Information flow
- Reporting and analyses option
- Systematic work flow
- Support and service

In order to conduct these listed tasks, ERP divides the functions of the company to different modules. These modules take their name from their functions. SAP modules is as follows.

- Financial Accounting
- Controlling
- Treasury & E-banking
- Investment Management

- Production Planning
- Materials Management
- Sales and Distribution
- Quality Management
- Warehouse Management
- Plant Maintenance
- Customer Service
- Project System
- Human Resources

Generally ERP projects have low amount of completion and 100 percent utilization[4]. Depending on a survey conducted by a consulting firm among 562 firms all over the world from different industries, the ratios of implementation outcomes are shown in Figure 2.2.

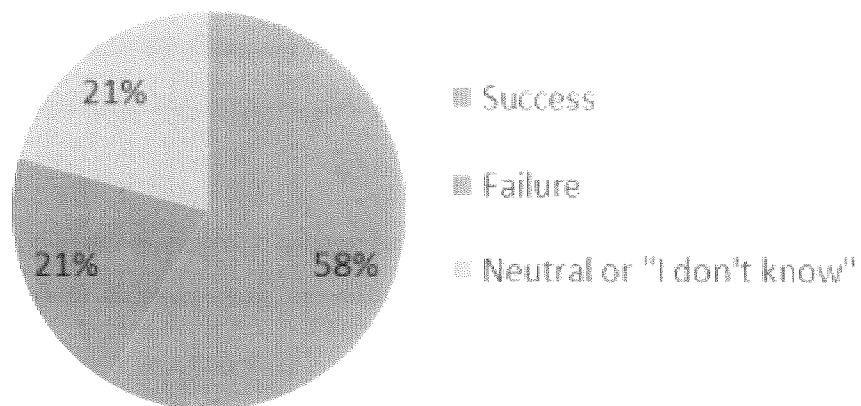


Figure 2.1 Implementation Outcome source:[6]

As the Figure 2.1 shows, only 21 percent of the respondents called the ERP implementation a failure, meaning 79 percent either did not know or believed their project to be successful. Although high amounts of money and resources are used during this implementations, it may turn out to be a total failure. Theoretically without a proper support of the adequate resources, the results of any implementation may not be as expected. There are several ways to support our implementation which are explained in the following parts of the study.

2.2 What is Project Management?

In order to define project management, definition of project concept is vital. Turner defined project as:

an endeavour in which human, material and financial resources are organised in a novel way, to undertake a unique scope of work of given specification, within constraints of cost and time, so as to achieve unitary, beneficial change, through the delivery of quantified and qualitative objectives.[7]

Project management is the application of management practices aimed at achieving the project goal and objectives.[8] It is suggested to plan the movement of a firm to reach its vision. Although the literature covers project implementation and planning, the beginning point of the project management is to ensure the correct decisions are made before the start.

Every project has certain properties that creates difference and value such as:

- Complexity
- Interrelated activities
- Time limitation
- Cost limitation
- Specification relevance

Complexity is the primary property of a project. Due to unpredictability and impossibility of repetition of a project, it generates uniqueness. Every phase of a project has an activities in a certain order and related with each other. Considering dependence and succession relationships, a schedule is bounded to be defined. Proportional to time, cost boundaries should be set for the project afterwards. After these boundaries, a project needs to have a certain scope in order to achieve technical and operational specifications, which are predefined properties generating project goals.

In planning of a complete lifecycle of a project it is crucial to apply long-term perspective that considers Customer Relationship Management (CRM) and Strategic Management (SM) of wider properties of project business. Benefits of the project should also be considered in a broad view where project provides both to the consumer and business elements.

In broad view perspective it is generally the value of business-centred management of a project over an enlarged life-cycle including pre and post project phases.

2.2.1 Project Goal and Objectives

The goal of the project can be define as the craved level of the project success in the future. It is roughly the description, the desired change level in system by the project and the beginning point for defining useful project objectives. There are 3 main questions to define project objectives which are, what is to be done(scope), when it is to be done(time) and what resources and cost is needed to be done(cost) [8].

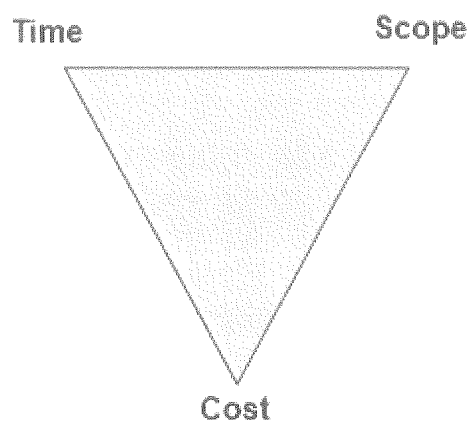


Figure 2.2 Project objectives Source:[8]

Depending on those questions and the parameters obtained a triangle diagram about project objectives can be generated. Project scope objective is the output that will be realized as a result of the project and the related requirements that are determined for it. The scope objectives compose of technical, functional and qualitative features of the product. Scope management is needed in order to follow; adequate amount of work is done; no needless work is done; the work which is done delivers the stated business objectives [7]. Considering ERP programmes, project scope objective can consist of module capabilities, possible operations that can be conducted over ERP and operation instructions.

Time objective can be defined as task completions within the predefined time interval. In the beginning of the project the tasks and their time intervals are defined in a Gantt chart and depending on that the dynamics of the project should be used to complete tasks within the predefined timing[8],[7].

The cost objective is the completion of the project in the predefined financial and physical resources. It includes business related-profit objective, at the end of the system setup the customer that receives main benefits makes payment for the project delivery. The amount of the price is directly proportional with the value produced by the project and this becomes the sales revenue for the supplier. In order to reach the profit target, that is determined as the difference of revenue and costs, the cost objectives should be defined by the supplier of the project in addition to budgeting for the revenue that will be achieved by the project [9].

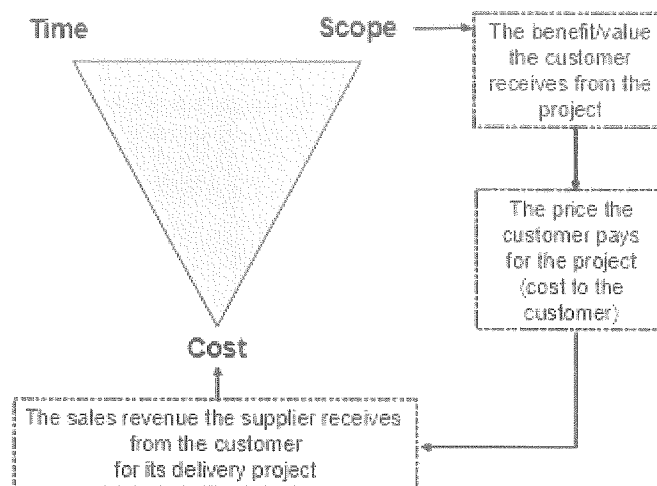


Figure 2.3 Project objectives: profit objectives are related to the cost objective

Source:[8]

The cycle of benefit exchange is shown in the Figure 2.3. Basically the benefit or the value is obtained by the customer and after the payment is done the supplier also receives its benefit. These three objectives are connected and can change depending on each other. For instance a change time objective directly has an effect on cost objective, if time for the project completion is shortened, correspondingly cost of the project will rise in addition to restricting the scope objective. Depending on the most weighted objective this relationship triangle shape may change. For some projects the time may be much more important objective and cost may be a sacrificed objective. Consequently, the solution triangle may move from optimal area. The prioritization of each objective should be well determined in the beginning of the project.

2.2.2 Project management as knowledge areas and processes

This is the primary and well known perspective that is stated in project management studies. Generally the companies conducting international businesses, produce their own project management guidelines based on their own know-how. The basic ingredients of project management are characteristic procedures, tools and methods.

Integration management is based on the procedures to support the completion of a project as an entity by integration of various sections of the project and its management. In addition to, objective specifications in the beginning and during the development of project, management dependencies and project plan.

Scope management stands for the procedures to control the requirements that has been determined are realized by the output of the project without using any additional resources [8]. Project breakdown structures and work breakdown structures are determined at this point. Sections, tasks, missions etc. of the project are arranged and needless work is skipped in order to increase efficiency.

Schedule management controls the time restrictions of the project. It leads the tasks to be completed in predetermined time period. Every time consumption for every single task is calculated and scheduled in possible charts like Gantt Chart.

Cost management deals with estimating project costs, budgeting and monitoring cost actions in order to ensure that project is realized in cost effective area and support the general financial state of the company.

Management of resource and personnel can be defined as availability, sufficiency and effective usage of resources during the project [8]. Schedule management is supported by resource management as it directly effects the utility of a certain resource in certain time period. Personnel related tasks such as project organization design, task identification and responsibility assignment, strengthening the collaboration in the project team.

Communication management stands for the information transaction and cooperation with both internal and external parties and stakeholders.

Risk management is the section where the main risks that may affect the project development are identified and measured in order to determine that the risks will be taken or avoided.

Procurement management involves seeking, choosing and using external resources for the project in addition to managing supply chain contracts, supplier firm selection and monitoring deliveries.

Quality management stands for measuring the requirements are fulfilled in terms of quality assurance, design and control.

This perspective is standardized by International Organization for Standardization (ISO), with ISO 10006, which contains instructions about project quality and management processes and these areas of knowledge that is listed on the top. Project management is directly related with the quality system of the enterprise.

2.2.3 Project management as competences and characteristics

After the knowledge areas and processes about the project is covered, management of the project can also be treated as competence that include the needed human behaviour for the success of the project. There are several types of competences and the differentiation is done depending on skills, knowledge, personal characteristics and attitudes. Knowledge and skills are thought to be visible competences. Values, personality attributes, aims, values and self-impression of a person are properties of characteristics and attitudes. These aspects lead individuals to apply their knowledge and skills in a certain way. In other words, their way of doing tasks are influenced by their properties.

Depending on the surveys conducted on this topic three types of competence level can be stated. Beginner, experienced in a field, experienced in more than one application environment are the levels of competence. Generally different competences is needed in different parts of projects. The project manager should have the ability to make utilization of project group and other stakeholders in terms of competence and use them in suitable manners.

There are some certain specialities that project managers should have in order to manipulate the projects correctly. This is presented in the Figure 2.4 below.

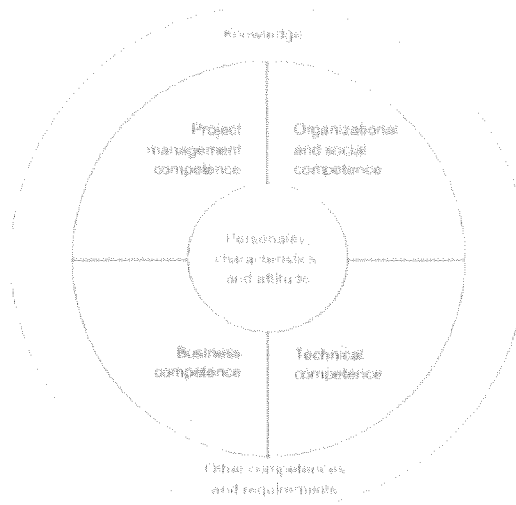


Figure 2.4 Competence areas of project manager Source:[8]

2.2.3.1 Business competence

It is generally defined as the ability to observe and apply the objectives that are base elements of the company [8]. It includes understanding the company's relations, customers of the company and their businesses, and knowledge about suppliers' and partners' way of doing businesses.

As a characteristic property, a project manager who has this competence should have some certain abilities like bonding the strategy and the project, remaining up to date about the industrial and technological changes, keeping the balance between ideal opportunities and the project scope in order to reach business objectives and estimating the effects of certain changes in business environment.

As a project manager, a certain understanding and knowledge about customer's business also a requirement which can provide some advantages for company's agility and decision making. It becomes easier to manage project deadline and schedules, so possible delays may be prevented beforehand. In addition to that customer range can be covered so that decision making and contract making may become easier to conduct. It may also be functional for providing future company collaborations in other projects and observing possible unexpected changes.

In terms of social and organizational competence, project managers should have skills such as leadership, communication, negotiation, problem solving in addition to influencing the organization. Leadership skills are important during the project and its role increases when the dimensions and complicatedness of a project increases. This skill helps a manager to create and manage the strategic vision for the project.

2.2.4 Project management as documentation and tools

This approach is more guiding and tool based than other approaches. Generally companies have their own project management models and experience, which leads them to have differences in tools and documentations. Visualisation is crucial in project management in order to minimize the misunderstandings and ambiguity related to the project. Forms (descriptive reports), instructions (guidance), checklists or templates (project initiation and outline) and techniques for planning and chasing (schedule management) can be listed as main tools of project management. In addition to mainly used office programmes, there can be use of additional project management IT solutions and systems.

2.2.5 Life cycle and Execution

Every project has a life time and during this time period there is a certain hierarchy that is to be followed in order to manage and execute the project well. This hierarchy of operations is called project life cycle, which generally stands for chain of states in which identification of ideas, expectations and opportunities are defined, execution of project is realized and the positive outcomes from the project usage are obtained and product usage is maintained.[8]

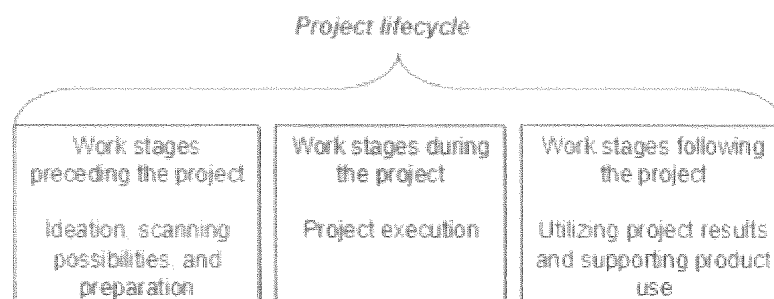


Figure 2.5 Project lifecycle Source: [8]

The project is generally about understanding the critical elements to reach a successful run and end product which will provide the marginal benefit and the main advantage to the customer. Depending on the type of the project, supplier may have the opportunity to provide several parts to the end customer as maintenance or support which can be an additional important part of the supplier's business.

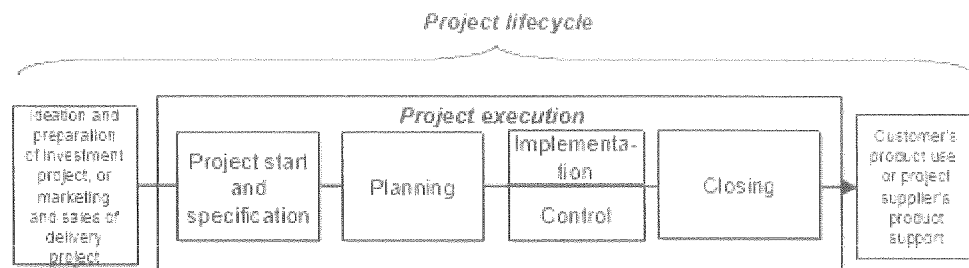


Figure 2.6 Project execution Source: [8]

Project ideology compose of different sub processes and actions that are bounded to manage these processes. This part of project life cycle is named as project execution. Figure above represents the most common phases of this execution. This states may have specializations depending on the type of the project.

Project start and specification phase: It is the step that why project is needed to be applied, requirements for the change aimed by the project, needs for possible problem solving, goals and objectives of the project are stated. Related risks and their possible effects on the execution are identified by conducting risk analysis. Project description and proposal are developed, or an initial project plan is acquired which contains related description or proposal related data, and plan of the project can be detailed in further planning phase. It is also crucial to consider the needs and outcome expectations of different stakeholders of the project.

Planning phase: It is the step that implementation related actions and resource specifications are determined. Considering these inputs, an implementation plan for activities in the project, a schedule which is needed for time management of the project, resource and cost orientation can be developed. Description and finalization of project composition is settled at the end of the planning phase. Staff that will take place in the project is usually determined in the earlier phase, which is specifications.

The outcomes of this phase is the main project plan, which is certainly improved version of the primary phase.

Implementation phase: Responsibilities are specified between the team members in addition to determination of the work procedures that will be used, the scope of the activities and extended resource needs are depicted in this step. Procurement of needed resourced are done and the execution of tasks are conducted considering the plan. One application that takes place in this step is assigning the right resource at right time to the right place, which can be defined as a proper supply chain execution, in order to create meaningful outcomes.

Control phase: It is defined as a parallel process that runs by a feedback mechanism to the planning phase.[8] In this phase, the comparison of the project progression with the technical specifications is conducted with respect to cost and schedule reports. Detections and explanations of the deviations from the objectives and plans should be stated in the reports in addition to having an alerting property for the possible future deflections of the project. If there happens to be a different progress with respect to project plan, then necessary updates should be done in the main plan according to new data.

Closing phase: It is the finalization and the delivery of the project to the customer by archiving the data of important tasks in addition to document finalization of the work flows. A closing and feedback meeting is generally conducted and a final report is prepared. Brief information about the project is provided to the customer as a detailed learning phase in which evaluation of the project is conducted with the customer and satisfaction feedback is collected from customer. Depending on the type of the project post hoc meetings can be held with project team and the stakeholders separately in order to maximize acknowledgement.

2.3 Balanced Scorecard Ideology

Balanced Scorecard can be defined as a framework for applying the measures that is derived from a certain strategy. [3] In this methodology the financial data about past performance is used to state future performance metrics about financial dimension. All other dimensions, which are customer, internal business process and learning and

growth, are derived from organizational strategy and they are stated visually by numerical objectives and performance metrics.

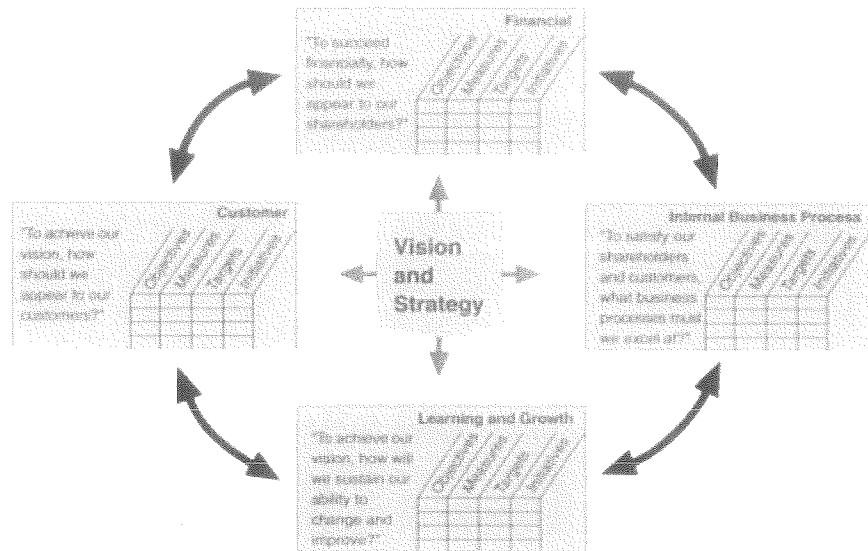


Figure 2.7 Balanced Scorecard Source:[3]

There are several benefits of this ideology for enterprises such as:

- Clarifying general strategy and provide enterprise agreement
- Transmitting the strategy in all organization
- Determining strategic applications and managing compatibility
- Linking long term objectives and annual budget with the strategy
- Realizing strategic inspections periodically and systematically
- Providing required data and feedback for evaluating and improving strategy

At the end of 20th century, the financial side of the trading organizations is really strong. Actually, giving too much importance to short term financial results, tend enterprises to make excessive investments to short term constants, that eliminates to invest long term success providing nonfinancial goods enough. As managers are kept under pressure for short term success, their seeking for long term success opportunities will be limited. Depending on Kaplan, the pressure to achieve short term financial success limits the new product, process, human resources, information technology, data bases and systems, customer and market development expenses [3].

In order to complete mission and achieve vision by following certain strategy, not only financial metrics but also the nonfinancial metrics such as customer, learning and

growth and internal business process should be considered. For long term success targeting companies, this ideology provides a general project management scope.

Considering this scope, ERP Project management methodology can be rearranged

2.4 ERP Project management

ERP project management is a wide topic and have high mistake making possibility.

Depending on [10], main steps of ERP project management are

- Requirement analyses
- Design
- Implementation
- Monitoring
- Maintain
- Performance metrics(KPI)

ERP implementation is not only a software integration for a company, but also a reorganization of procedures in the organization. It provides a certain standards for specific departmental operation which is thought to improve and strengthen the process. Change management is also a key point of ERP project management.

2.4.1 ERP Implementation

The success of an implementation depends on the steps that are taken during the project management, which are requirement analyses, selection, implementation and continuous improvements after implementation. Depending on Erkan [10], if there is no change management and wrong ERP selection is made there is nothing more to do. Considering [11], there are 3 types of ERP implementation.

2.4.1.1 The Big Bang

This is considered as the hardest ERP implementation type for enterprises. After some preparations the old system is completely left and the new system is taken in to action. This is founded to be risky as company faces with new way of doing business and new software suddenly [10]. For big scaled companies this is not recommended.

2.4.1.2 Franchising Strategy

The companies having more than one branches use this strategy. The implementation is done in one branch and then taken into usage in other branches of the company [10]. It is advantageous as possible problems in the implementation don't effect all of the company. On the other hand, long implementation time and having no complete project monitoring from the beginning can be listed as disadvantages of the strategy.

2.4.1.3 Slum-dunk

Smaller scaled companies that are aiming to grow with business process reengineering and ERP implementation use this strategy. Strategy aims to pass ERP system smoothly. This is generally selected by the companies having inadequate operational systems and additional improvements can be done when application experience increases [10]. Despite the long implementation time it is considered as least problem occurring implementation. In this strategy before leaving the old system, new system is partially taken in to usage.

2.4.2 Implementation expectations

Due to the high financial investments on ERP, there is a generation of high expectations proportionally. Main expectations is listed in Mabert et.al 2000 as follows. [12]

- Reaching data faster
- Improvement in Internal Communication
- Upgraded Order management
- Decreased Financial Procedures
- Improvement in Customer Relations
- Increasing in On time delivery
- Improvement in Supplier Relations
- Upgraded Cash Management
- Decreasing Indirect Operational Costs

There are several methodologies to select, integrate and maintain ERP projects. One of the well-known methodologies is ASAP (Accelerated SAP) methodology. It is a

project management methodology that is developed by SAP with the experience and the know-how depending on ERP integration projects.

It has five main steps [13]:

1. **Project preparation:** In this step project targets are set. Scope of the application is also determined. The stakeholders of the project are formed and the resources are determined. The order of the tasks are defined and all of these steps are documented and approved.
2. **Business Blueprint:** The aim of this step is making the usage and benefit expectations of the system common purpose. The goals and targets of the project is detailed. After need analyses its results are collected in a document called Business Blueprint. The questions are asked about every business processes. Present condition is defined and documented, which is called AS IS analyses, by the core team. The aimed condition after project is completed is defined, which is also called TO BE analyses. GAP Analysis about the differences between AS IS and TO BE analyses is conducted and documented. In the end the approval documents are confirmed.
3. **Realization:** The needs that occur in the business Blueprint are applied to system. While this operation is on run, general configuration is done which is followed by conducting detail configuration. In addition to that, another documentation is done for this additional configuration.
4. **Final Preparation:** Unit tests are done. Generally it is conducted as module based. Integration testing, that controls the harmony of the module with other modules or systems, is applied. User education and testing is done. The module chief educates the customer side, which is generally named as key user, and testing from customer side is expected at the end of the education. Before going live, master data and transactional data, if it will be used, is prepared to transfer to ERP system. In Sap systems there are several tools for this task like LSMW and SCATT.
5. **Go live and Support:** The monitoring of the system performance and general course after going live is conducted in this phase. Customer support is provided in addition to completing optimization requirements. For usage of this methodology SAP developed and provided a module that contains roadmap, template and workpackage.

After complete implementation and starting the new system, depression occurrence is expected. As operations in the firm are conducted in new ways, dissimilarity in tasks may happen for a short period of time.

It is claimed that ERP failure rates has a range from %40 to %60 due to research done by Langenwalter[14]. Due to a different definition, failure is defined as an implementation which doesn't reach the Return On Investment (ROI) defined in the project approval phase [15]. This ratio is defined in the range of %60 to %90.

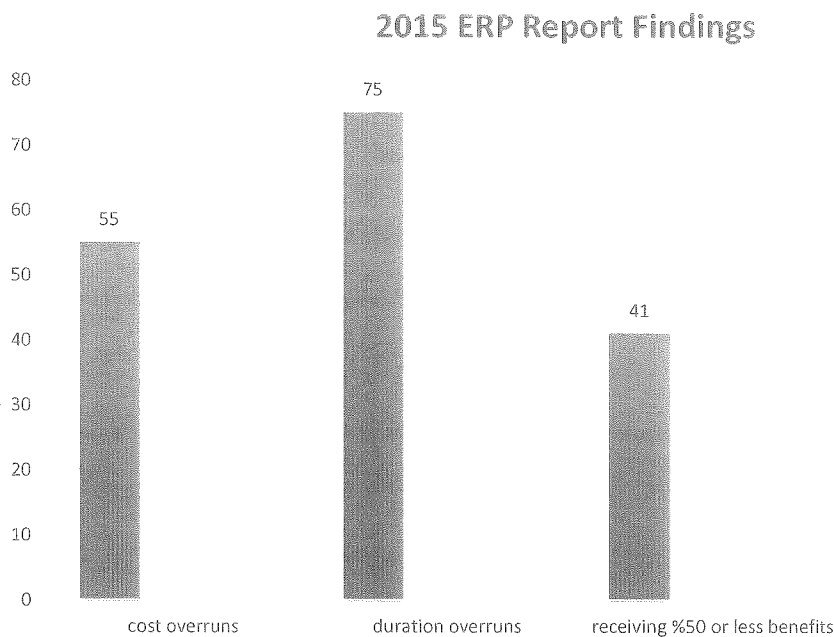


Figure 2.8 ERP Report Findings Source: [6]

Depending on the graph gathered from ERP report of Panorama consulting [6], %55 of the ERP projects are conducted with additional budget. In addition to that %75 percent of ERP projects end up with duration overruns. The time calculated to complete the project is usually not sufficient.

2.5 Umble's 10 Critical Success Factors

Criticising success is important factor in project management. Umble and his colleagues worked on critical success factors for ERP implementation and collect them under 10 main topics. [2]

- Clearly setting strategic goals
- Top management commitment
- Good Implementation of project management
- Qualified implementation team
- Adequate education team
- Commitment of organization to change
- Data Accuracy
- Performance metrics monitoring
- Dealing with technical issues
- Multi-site issue resolution

Although the path for a proper ERP implementation is obvious as a template, problems still occur during the implementation. These problems may occur due to ERP implementing firm, software or consulting firm [10]. Depending on literature, they can be minimized by a good conducted project management.

2.6 Hofstede's Methodology for Comparing Businesses

This methodology deals with business making styles of firms considering their nationality. Methodology is developed by Professor Geert Hofstede by analysing the large database of employee value scores that are collected within IBM between the years 1967 and 1973[16]. Data is covered from 70 countries but first 40 countries data is used that have the largest respondent groups and then it is enlarged to 50 countries.

There are 6 dimensions of Hofstede's methodology for evaluation which are power distance, individualism, masculinity, uncertainty avoidance, pragmatism and indulgence [16]. As ERP project success ratio of Finland is closer but higher than Turkish Industry success ratio, it can be a short term goal to reach the same level of success. Considering these the business making styles gain importance. Comparison in this topic can be useful for developing a proper roadmap of a proper project management.

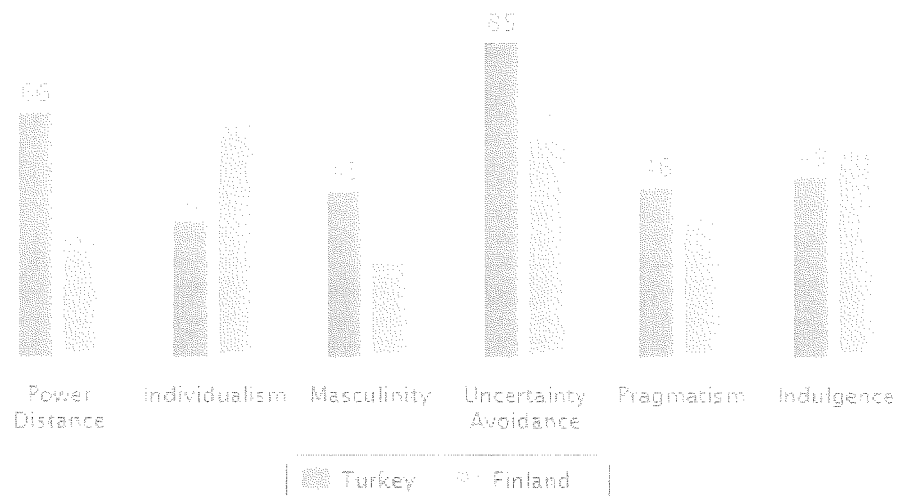


Figure 2.9 Turkey with comparison to Finland Source: [7]

The range of the scores in the graph are from 0-100 and 50 is considered as a mid-level in any of the dimensions.

2.6.1 The Case in Turkey

Cultural comparison is crucial for project management. If the Turkish culture is explored under the scope of 6D model, the base dynamics of this culture can be analysed well with respect to other cultures. The dimensional explanations and discussions are presented in the following parts.

2.6.1.1 Power distance

This dimension states the inequality fact among the individuals in a population. It is stated for the perspective of the culture to these inequalities between people. Power distance is generally expressed as the degree of expecting and accepting that power distribution is unequal within a country by the less powerful members of a community. As Turkey has high score (66) in terms of power distance characteristics such as being dependent, having loyalty to hierarchical management and it is hard to reach superiors in addition to power centralization. The bosses and their rules are strictly relied and followed by managers. There is generally expectation of being told what to do among employees. Expectation of control and formal attitude to managers is present. In addition to selective data flow, the communication is generally indirect. Just like a family unit, there is a head officer, like father, to whom others obey.

2.6.1.2 Individualism

The basic point referred by this dimension is the amount of interconnection between members of a population. It deals with the perspective of people on their self-appearance is defined whether 'I' or 'We'. In other words while Individualist populations are expected to take care after themselves and their direct family, in collectivist populations individuals are part of groups that look after them in return of their loyalty.

Turkey is a collectivistic society with respect to its score (37). This states that the actions are conducted for protecting the group and people who are members of a group take care of each other in return of their adherence. In addition to having in direct communication, the compatibility of the group should be maintained and open disputes are refrained. The relationship has ethical values in base and it has more importance than task accomplishment. Time should be spent to build trust in relationship at the beginning. Nepotism might be observed more frequently. There is always indirect feedback even in business environment.

2.6.1.3 Masculinity

This dimension shows, if the score is high (masculine), the degree of thirst and ambition in the population to reach success especially being titled as best in field. This is engaged to the culture as a value system that begins in school time and progresses through organisational behaviour.

If there is a low score on this dimension (feminine), it can be stated that population has other important values that care for other elements and quality of life. For a feminine society the life quality is the evidence of success and staying beside the crowd is not desirable. The major point is the source of motivation for people, either desiring to be the best, or enjoying what you do.

Considering that its score is 45, Turkey stays at the feminine part of the scale. This is evidence that aspects such as equalization with others, harmony and sensitivity for the weak are more important and supported. Struggles are avoided both in work and private life and the compatibility at the end is crucial. Spare time has importance for this culture, which is the time period that all members of a population come together to take pleasure of life.

2.6.1.4 Uncertainty Avoidance

Dealing with the suddenness and unpredictability of the future is the issue of uncertainty avoidance dimension. This unclear condition creates anxiety and every culture has different style of dealing with this feeling. The concerns of a society about uncertain or unknown situations and presence of their scenarios to get rid of this condition is reflected by Uncertainty Avoidance Index (UAI) score. Considering that Turkey got score of 85, there is a great requirement for laws and rules. In order to decrease the amount of feeling threatened, individuals use many rituals. As it makes many references to god, it might seem for the ones from other cultures religious. Usually they are traditional social figures used to calm down the strain.

2.6.1.5 Pragmatism

The connection of societies with their past, how they use it for the present and future challenges and how they prioritise these goals differently is evaluated in this dimension. Standard populations those score low on this aspect, for instance, preserve conventional traditions and criteria during monitoring social change with conjecture. Cultures having high score, follow more pragmatic scope, in which they support austerity and efforts in modern education as a strategy to prepare for the future. Turkey scores 46 which is an evidence of having intermediate level and having no specific cultural choice.

2.6.1.6 Indulgence

Socialization has been an issue that humanity faces at childhood. Indulgence dimension can be explained as degree of people trying to command their desires, based on the type of being raised. Similarly the low level of control is called 'indulgence' and high level of control is called 'restraint'. With a score of 49, this characteristic cannot be determined for Turkish culture.

CHAPTER 3

RESEARCH METHODOLOGY

In this study our main aim is to define a proper setup methodology to provide a business transaction system. Firstly, a survey is conducted between companies from Finland and Turkey in order to obtain comparative data. The survey results say that the success ratios of ERP implementations in Finland happens to be much more successful than Turkish examples. In this study, the aim is to obtain and state the key activities in order to observe the business transactions properly.

In order to prepare a proper roadmap for ERP the cross-country comparison is conducted between Finland and Turkish enterprises. For this comparison a survey is conducted in companies from Turkey and Finland. In this survey the companies are wanted to order the project management processes, the module importance and integration percentages. The main aim in selecting different countries is to obtain comparative graph and the higher rate of successful ERP project completion ratios of Finnish enterprises which can be seen in the figure below.

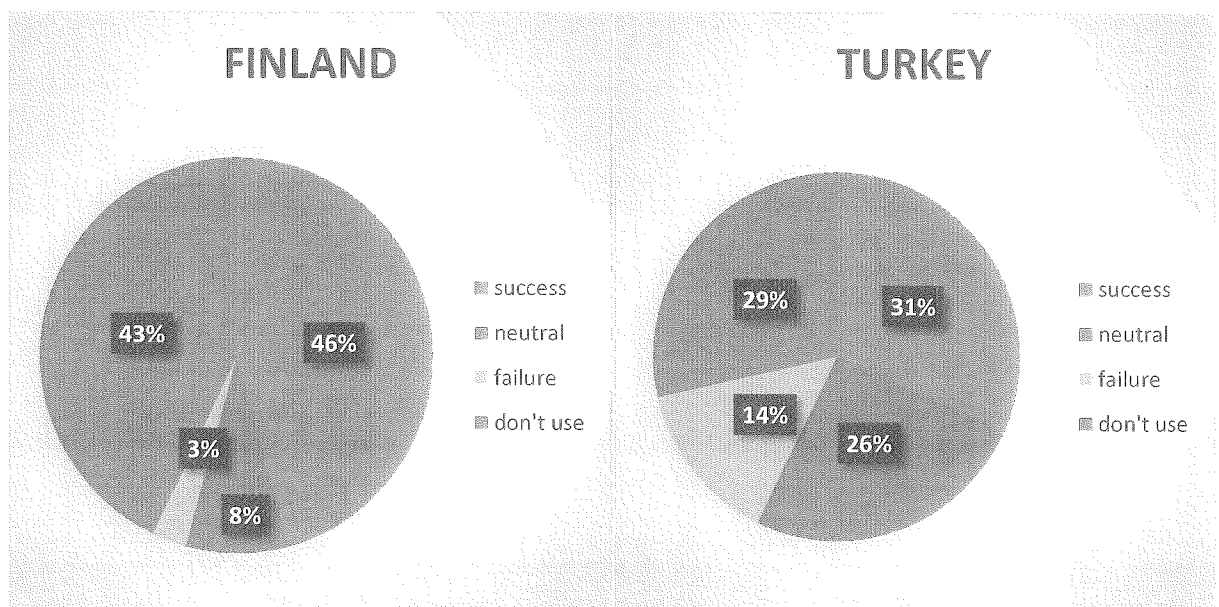


Figure 1.1 Distribution of ERP Implementation

This graph is obtained by the data gathered from 35 companies from Finland and 70 companies from Turkey. 43 percent of the attendants in Finland and 29 percent of the Turkish attendants prefer different business transaction methodologies from ERP. If only ERP using firms are considered the implementation success graph obtained in Figure 3.2 below.

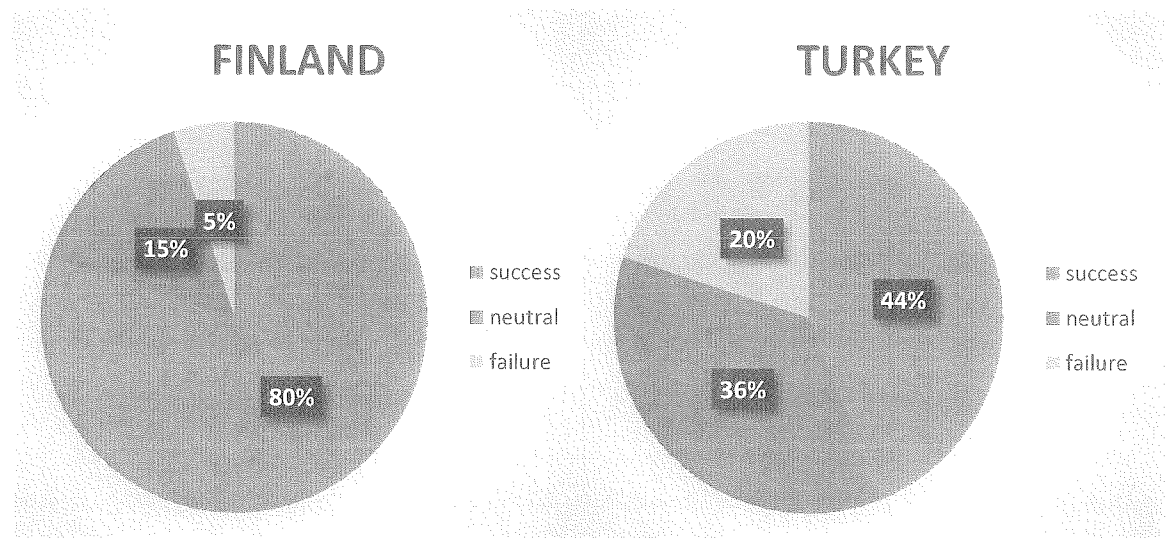


Figure 2.2 Implementation Success

The main survey is conducted on 20 companies from Finland and 50 companies from Turkey those of which implemented ERP. In the main survey conducted on the companies that use ERP systems, several questions are asked to attendants. Due to their company policies, answer of all questions are not provided by the companies. The questions that are numerical and needs logical ordering are answered by the companies.

3.1 RESEARCH QUESTIONS

In this study to understand the difference of scope and perspective on general ERP implementation project, several questions are asked to the companies. Most critical questions are listed below.

CRITICAL QUESTIONS OF SURVEY

<i>Q8</i>	Would you please make an estimate of the following cost categories actually incurred in your ERP implementation?	Software license/ Hardware Implementation/ Consultants/ Training/ Other costs
<i>Q9</i>	Please rate the degree of your agreement with the following statements. (1= Least- 5= Highest)	
<i>Q9.1</i>	The ERP implementation has been completed within budget.	
<i>Q9.2</i>	At the present moment, the ERP system is successfully used.	
<i>Q9.3</i>	The required functionality of the ERP system was fulfilled.	
<i>Q10</i>	Please rate the level of top management support for your ERP project	
<i>Q11</i>	Please rate the level of effectiveness of the project management of your ERP implementation.	
<i>Q12</i>	Please rate the degree of business process reengineering for your ERP project.	
<i>Q13</i>	Please rate the level of education and training in your project.	
<i>Q14</i>	Please rate the level of user involvement in your ERP project.	
<i>Q16</i>	Please put the following modules of ERP system in to an importance order for your company.	Human Resources/ Finance/ Sales and distribution/ Supply Chain/ Plant Maintenance/ Production Planning/ Manufacturing/ Purchase/ Inventory/ Quality Management
<i>Q17</i>	Please select the top 10 critical success factors for ERP implementation from the list below.	

Table 3.1 Critical Questions of Survey

Rest of the questionnaire is presented in Appendix D.

CHAPTER 4

RESULTS

The results of this study are given under two sections: the critical question results and the informational results.

4.1 Informational Results

This part of the survey is composed of the answers about the companies' background. As it is previously stated survey is conducted with 20 companies from Finland and 50 companies from Turkey. Their sectoral distribution is provided in Table 4.1.

	Production	Service
<i>Finland</i>	13	7
<i>Turkey</i>	32	18

Table 4.1 Sectoral distribution of the firms

The implementation time is an important factor that effects the cost directly. The averages estimated and actual implementation times are presented in Table 4.2.

	Estimated Time (year)	Actual Time (year)
<i>Finland</i>	1	1,1
<i>Turkey</i>	1,2	1,6

Table 4.2 Implementation time averages

4.2 Critical Question Results

In the beginning of the critical questions, the budget utilization percentages are gathered from Turkish and Finnish companies.

Q8: Would you please make an estimate of the following cost categories actually incurred in your ERP implementation?

Four way probability plot, which is kind of a goodness of fit test, is conducted in MINITAB 13 in order to have an idea about the distributional assumption about data. As a result of the related test, the data collected for software, hardware and consultancy is assumed as normally distributed and 2 sample t test is conducted among the data. 2 sample t test is generally used to compare 2 populations in terms of their means and standard deviations [17]. This comparison can be visualized with a boxplot in which centre points are means of the population and the whiskers are the range occurred depending on standard deviation. The statistical test results are presented in Appendix A. Data collected for training and other costs cannot be considered as normally distributed and they cannot be commented under 95 percent confidence interval. Depending of the data gathered from the survey, about cost using percentages some certain differences are observed. It can be seen from the table below.

	TURKEY (%)	FINLAND (%)	P-VALUE
Software	38,26	42,3	0.000
Hardware	25,44	34,3	0.000
Consultancy	18,2	3,3	0.000
Training	11,7	12,15	0.340
Other	6,56	7,95	0.073

Table 4.3 Budget usage ratios

Considering the survey results about implementation budget, main difference is in consultancy topic. There is a 14,9 unit difference in consultancy cost. This cost is low in Finland by a management strategy. In spite of outsourcing the consultancy, Finnish enterprises make consultants part of their company. The consultancy is given to the firm by itself. Due to the tax differences in Finland the hardware costs are slightly higher than Turkey which explains the percentage differences between these topics. This difference is made clearer by the box plots in the Appendix A. Considering the p-values the training and other costs cannot be compared in 95 confidence interval. Second analyses is about the ERP experiences of the firms. In both countries data is gathered about following issues:

- Budget
- Usage Success
- Functionality fulfilment
- Project Management
- Business process reengineering
- Education and Training
- User involvement

Enterprises scaled their ERP systems from 1 to 5 and a certain score about 2 countries obtained, where 1 is the lowest and 5 is the highest score. As our data consist of ratings, Mann-Whitney test is conducted, instead of t test, on the data in order to test the presence of significant difference between cross-country data. Calculations of this test is presented in Appendix B. As a result of this test our data is found out to have no significant difference in 95 percent confidence interval. It can be noted that Mann-Whitney test requires that U value should be smaller than or equal to the critical value different from other statistical tests. As the test states that significant difference, ratings are likely to be compared.

Q9.1: The ERP implementation has been completed within budget.

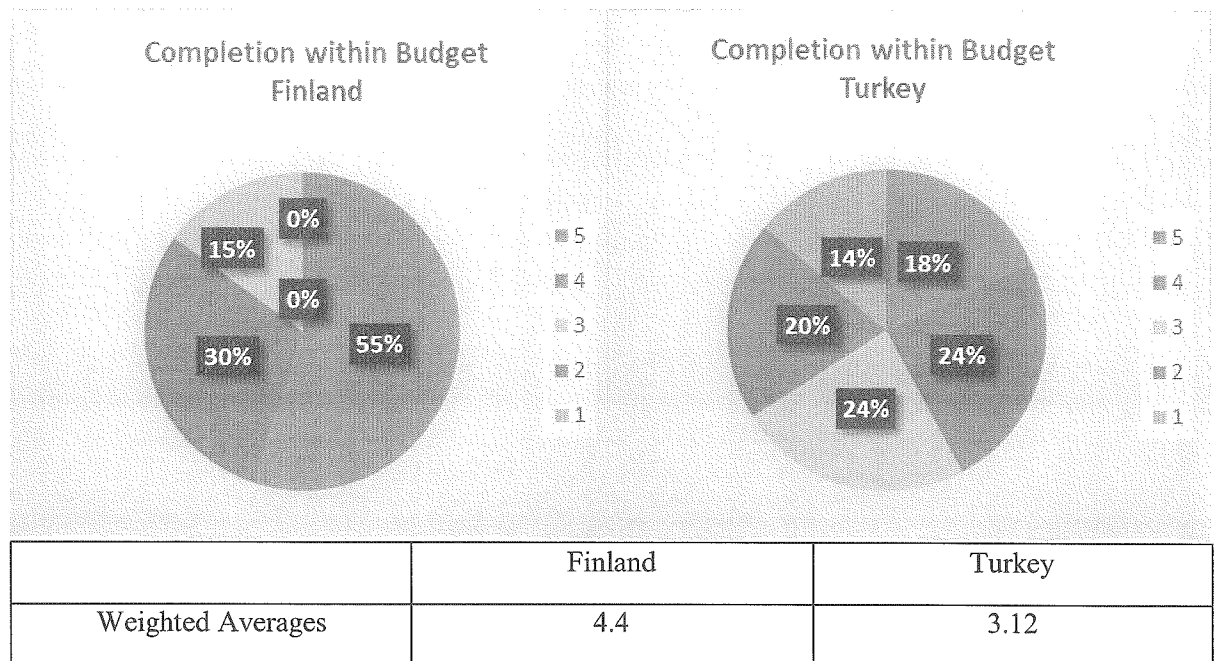


Figure 4.1 Completion within Budget ratios

In order to make a better comparison, pie charts are created with the data gathered from 2 countries. As it can be seen from the graphs above 55 percent of the ERP implementations in Finland completed within predetermined budget, while only 18 percent of the implementations completed without making any additional expenses. It is obvious that the additional amount of expense done in Finnish applications are less than Turkish examples.

Q9.2: .At the present moment, the ERP system is successfully used.

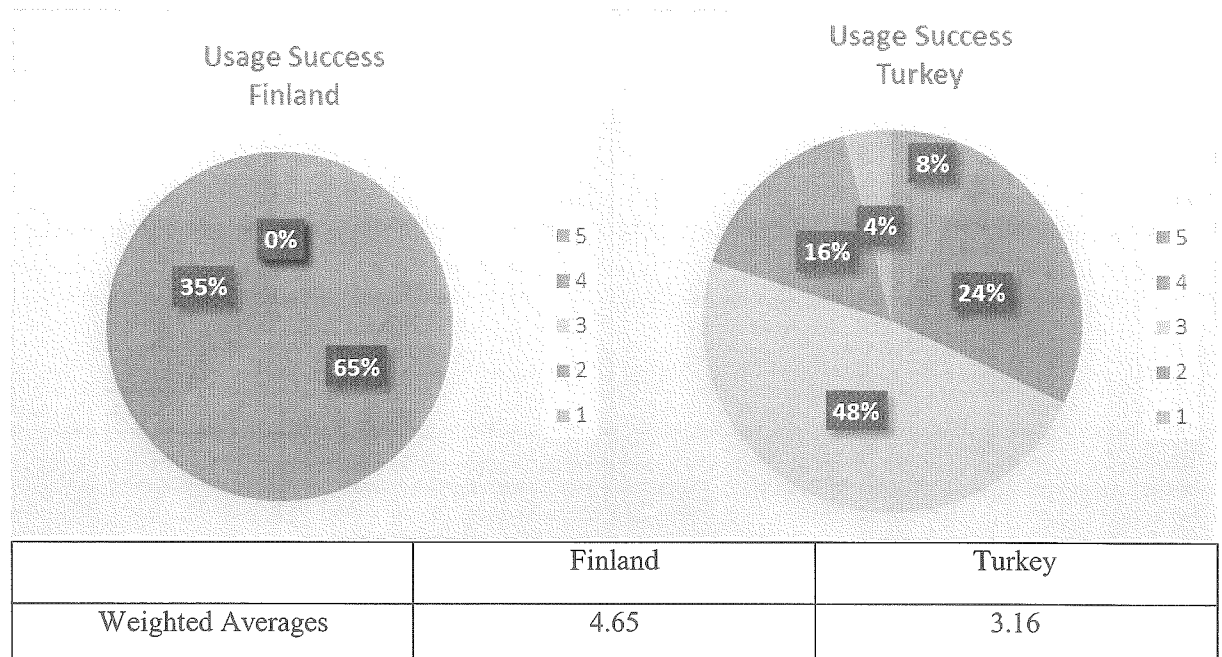


Figure 4.2 Usage success ratios

In terms of usage success 65 percent of the companies from Finland have complete success in using ERP systems, while 8 percent of Turkish enterprises have complete success in usage of ERP. Considering the average scores of 4.65 for Finnish companies and 3.16 for Turkish companies, the gap in this topic is presented.

Q9.3: The required functionality of the ERP system was fulfilled.

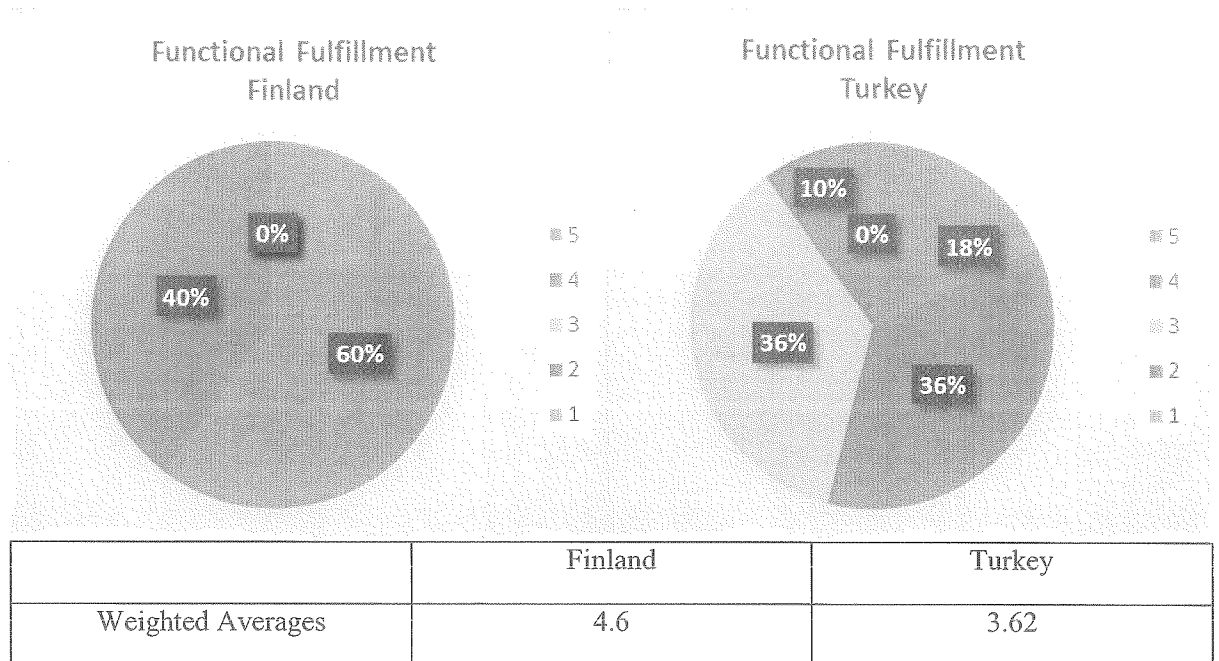


Figure 4.3 Functional Fulfillment Ratios

For functional fulfillment of the ERP category, 60 percent of the Finnish enterprises are using every function of ERP that is present, but Turkish value of this category is only 18 percent. Average scores of 4.6 (Finland) and 3.62 (Turkey) show the difference between two countries.

Q10: Top management support refers to the fact that the ERP project needs to receive approval from top management. Please rate the level of top management support for your ERP project.

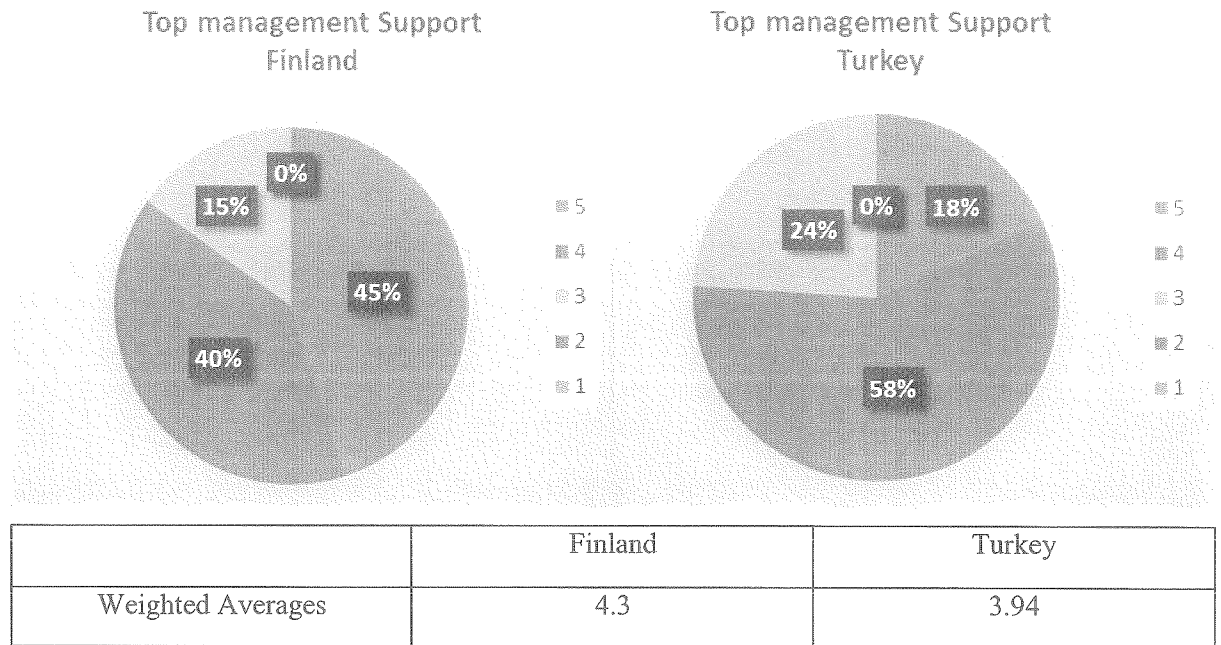


Figure 4.4 Management Support Ratios

Considering data gathered, 45 percent of Finnish seems to have complete support of management during ERP implementation while in Turkish enterprises it is only 18 percent. Nevertheless we can talk about the top management support for the companies in the remaining parts of the pie chart and the difference can be observed from the average scores of the countries which are 4.3 and 3.94 respectively.

Q11: The effective project management refers to the effective planning and execution of the implementation process. Please rate the level of effectiveness of the project management of your ERP implementation. (1-5 scale)

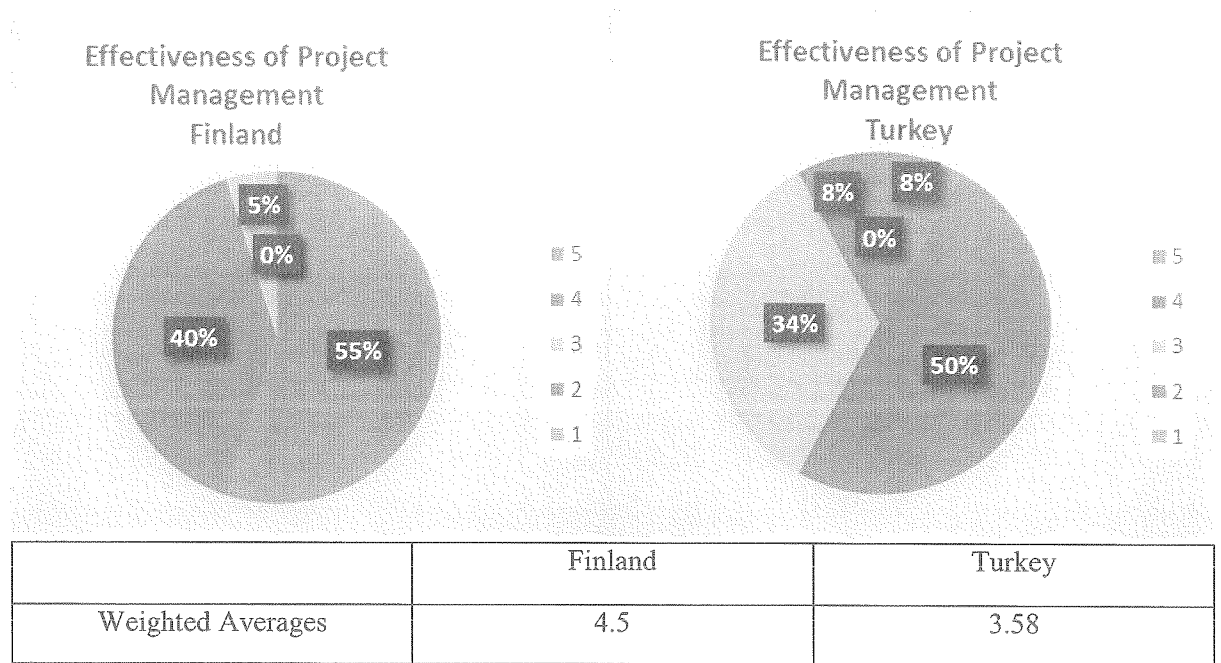


Figure 4.5 Effectiveness of Project management Ratios

55 percent of the Finnish companies rated themselves to have effective project management, while only 8 percent of Turkish companies consider themselves to have effective project management. Scores of 4.5 for Finnish companies and 3.58 for Turkish companies provides information about the difference on project management effectiveness.

Q12: Business process reengineering refers to aligning the company business processes with the ERP software that will be implemented. Please rate the degree of business process reengineering for your ERP project.

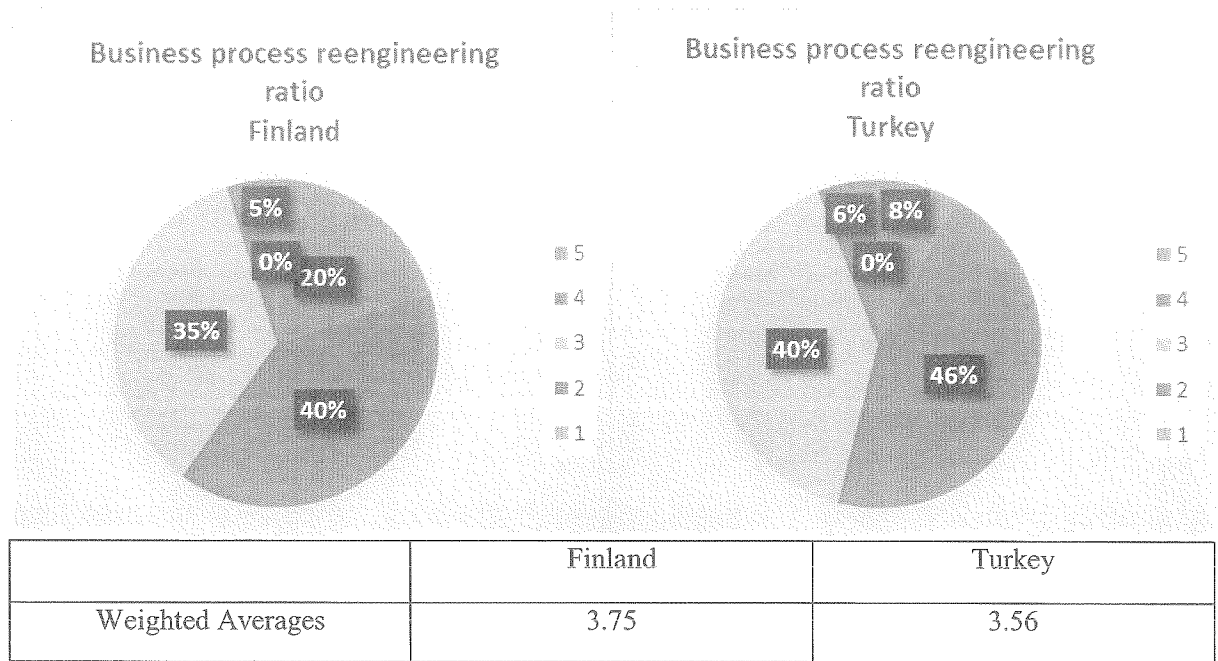


Figure 4.6 Business Process Reengineering Ratios

For Business Process Reengineering (BPR) part, 20 percent of the Finnish companies went through a complete BPR, 40 percent went through 80 percent BPR and 35 percent has slight changes in their processes when they implemented ERP. In Turkish side of the research 8 percent had complete BPR while 46 percent has 80 percent of BPR and 40 percent has slight changes in their business transactions. Finnish countries has average score of 3.75 and Turkish companies has an average score of 3.56 on this dimension.

Q13: Education and Training refer to the introduction of the ERP concepts to the future users, and to providing training with regard to the features of the ERP software. Please rate the level of education and training in your project.

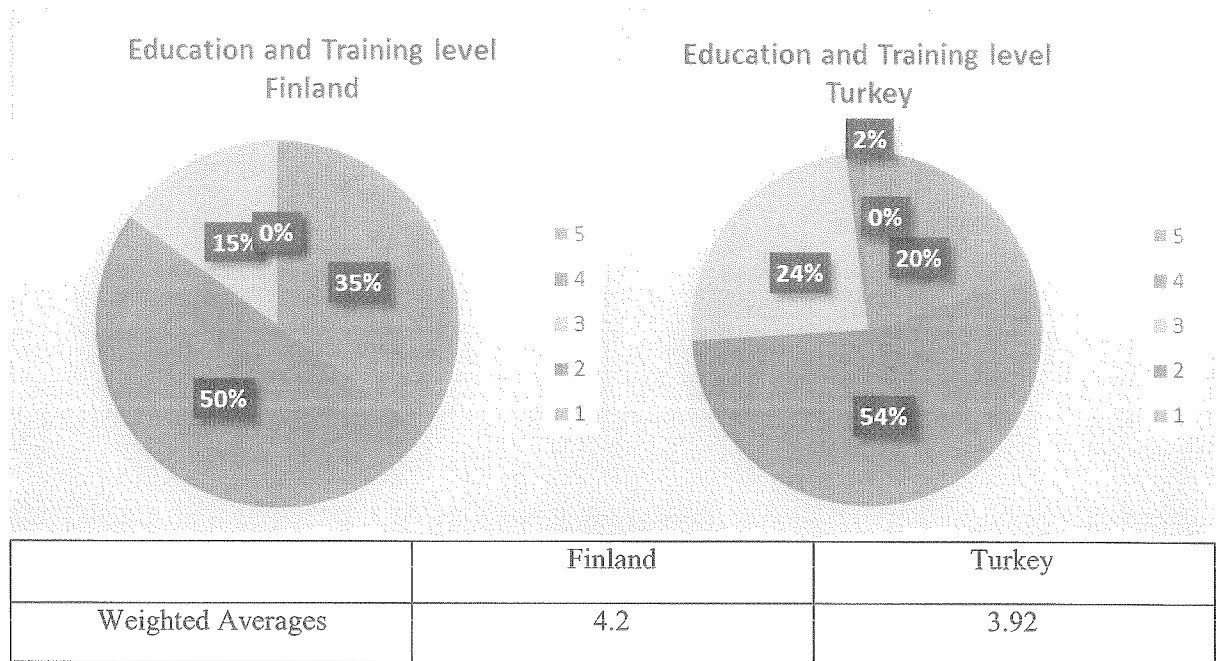


Figure 4.7 Education and Training Level

Education and training level about integrated ERP is an important topic. As it can be seen from the graphs and averages above, the education ratios in Finnish companies are higher than Turkish companies respectively.

Q14: User Involvement refers to the users' participation in the development and implementation of the ERP system. Please rate the level of user involvement in your ERP project.

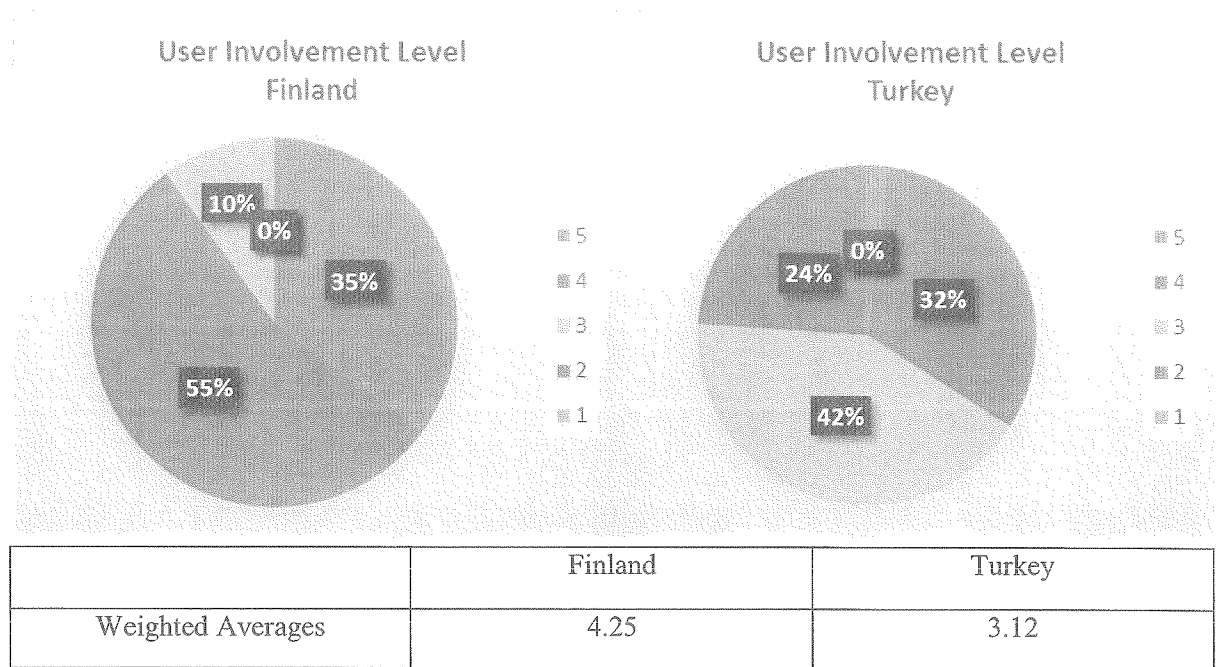


Figure 4.8 User Involvement Ratios

User involvement levels of Finnish companies is at highest level for 35 percent of the companies, and this gives idea about the level of interaction with users and the system in addition to rate of customization. This level of difference on this dimension can be also be observed form average scores of the countries, which are 4.25 (Finland) and 3.12(Turkey).

Q16: Please put the following modules of ERP system in to an importance order for your company.

In the other part of the research, companies are wanted to order ERP modules depending on their importance. 10 modules of ERP is provided to the companies to order and the results are given in the table below.

	Medians of Turkish	Medians of Finnish	Module order of Turkey	Module order of Finland
Human Resources	4,5	7	3-4	8
Finance	2	5	1	5
Sales and distribution	4,5	6	3-4	6-7
Supply Chain	8	9	9	10

Plant Maintenance	9	8	10	9
Production Planning	4	3	2	1-2
Manufacturing	6	4,5	7-8	4
Purchase	5	3,5	5-6	3
Inventory	5	6	5-6	6-7
Quality Management	6	3	7-8	1-2

Table 4.4 Module Ordering

The medians of the module order among the companies are taken to provide a possible order. As it can be seen while Turkish enterprises are determined on Finance module, while the production planning and quality module are on the top order of Finnish enterprises. This provides a perspective about the scope of ERP implementation in different countries.

Q17: Please select the top 10 critical success factors for ERP implementation from the list below.

The last analyses done with the conducted survey was about critical factor definition. Enterprises were given 19 critical success factors and they are wanted to choose 10 of them. The percentage evaluation of the critical factors can be seen from the table below.

	FIN	TUR
Good project scope management	75%	56%
Management expectations	45%	58%
Project management	75%	68%
Steering committee	45%	46%
Cultural change/political issues	20%	12%
Business process reengineering (BPR)	55%	82%
Adequate resources	55%	80%
Trust between partners	20%	48%
Interdepartmental cooperation	70%	38%
Project team composition/team skills	70%	48%
Managing consultants	45%	46%
Software customisation	45%	62%

Training on software	55%	84%
Vendor support	40%	52%
Formal methodology-ERP implementation strategy	60%	32%
Adequate ERP software selection	60%	60%
Clear goals and objectives	80%	52%
Empowered decision makers	30%	30%
Management support and commitment	55%	46%

Table 4.5 Critical Success Factor Ratings

As the selection percentages of the critical success factors are obvious the listing of top 10 criteria can be done.

Finland CSF	Turkey CSF
Clear goals and objectives	Training on software
Good project scope management	Business process reengineering (BPR)
Project management	Adequate resources
Interdepartmental cooperation	Project management
Project team composition/team skills	Software customisation
Formal methodology-ERP implementation strategy	Adequate ERP software selection
Adequate ERP software selection	Management expectations
Business process reengineering (BPR)	Good project scope management
Adequate resources	Vendor support
Training on software/Management support and commitment	Clear goals and objectives

Table 4.6 Top Ten Critical success Factor

CHAPTER 5

DISCUSSIONS AND CONCLUSION

In the beginning of the study, the basic definitions are done and a basis for survey and possible numerical methods are created. The researches about Finland Enterprises is conducted and completed, the data from Turkish enterprises is collected. Then the cross-country comparison is done and depending on the categories defined in the survey.

In the survey that is conducted about ERP, first analyses question was about budget utilization. In this comparison, it is clear that the percentage of consultancy cost is less in Finnish companies when it is compared to Turkish examples. This is a strategy for Finnish companies to use their internal sources for customization, support or recovery of an ERP system. In the same comparative scope, it is known that hardware costs are higher in Finland due to the governmental tax regulations. Despite that fact, it is known to changes utilization amount, complete project cost differentiates country-wise. Some of the Finnish companies founded to have high percentage of other cost. As a result of deeper and off-the-records investigation, this amount is said to be used as motivational promotion between implementation personnel.

In the second part of the analyses, there were 8 questions in order to make comment about general scope and perspective ERP in different countries. In order to check the project scope questions are asked. First question was asked to determine the budget estimation accuracy. As Finnish companies (4.4) has higher average score of within budget completion ratio than Turkish companies (3.12), it can be stated Finnish companies are more successful in variable cost estimations of ERP projects than Turkey.

Second question was for having idea about usage success of ERP at the moment. The score of Finnish companies is founded to be higher than Turkish ones. Success in usage parameter can stand for the importance of present system in use and loyalty of the internal customers to the system.

Third question was to see the functional fulfilment amounts, which can be named as the fitness of functional expectations to achieved functionality. Turkish enterprises generally have high expectations as they spend more. Usually the capabilities and targets are set in the project ideation and preparation phase, but depending on the survey only 18 percent of Turkish companies use their ERP systems with complete functionality while 60 percent of Finnish companies have the complete functional fulfilment. As their average score is 4.6 (Finland) and 3.62 (Turkey), it can be concluded that for Finnish enterprises get what they expected from the ERP system and they trust in their system. Considering the country-wise CSF determination, management expectations is founded out to be a critical success factor for Turkish enterprises where it is not a critical success factor for Finnish enterprises.

Another topic in the analyses was top management support. It is observed that 45 percent of Finnish companies has complete management support for ERP implementation whereas Turkish companies have only 18 percent complete management support. If the average score is taken in the account, which is 4.3 for Finnish companies and 3.94 for Turkish companies, it would lead us to make the following comment. Generally speaking, for Turkish companies the top management support has much more importance to obtain successful implementations due to having higher score of power distance than Finnish enterprises. Recalling the CSF determination, it is not stated as a critical success factor by most of Turkish enterprises.

Effectiveness of project management is also tested in this survey. 55 percent of the Finnish companies has effective planning and execution of implementation stage where this ratio is founded out to be 8 percent for Turkish enterprises. The average scores of 4.5 for Finnish companies and 3.58 for Turkish companies can provide us the real difference. In CSF determination stage project management is stated to be a critical success factor both of the countries, but in Finnish companies the CSF is supported by project team composition/team skills and formal ERP implementation strategy. Therefore this can be stated as a critical difference between 2 companies for achieving a successful ERP implementation.

Business process reengineering is another point of view in the survey. For Finnish companies 20 percent of companies completely align their business processes with ERP software that will be implemented where Turkish enterprises have 8 percent for

complete BPR. The scores of 3.75 (Finland) and 3.56 (Turkey) shows that the BPR application ratio differs. With respect to Hofstede' methodology, Uncertainty Avoidance Index of Turkey is higher. Due to this fact it can be understood having prejudice to surrender all transactions and operations to a single system. Considering CSF determinations, for both countries BPR is defined as a critical success factor for ERP implementations. Consequently, it can also be concluded that BPR can also be stated as critical point for successful implementation.

Education and training is one of the dimensions in the survey. Introduction of ERP concepts to the future users and providing training about features of ERP software in 100 percent of the company is 35 percent in Finnish enterprises and 20 percent for Turkish enterprises. Due to the average scores of 4.2 for Finnish companies and 3.92 for Turkish companies, it cannot be said that education level about ERP is low. In the budget utilization part of the survey almost the same percentages of training cost is spent. This education is crucial for continuity of ERP ideology and system.

User involvement is another sight of view in this survey and it is used for user participation during ERP implementation phase. As users have been assumed as the source of innovations [18] and customization, internal customer learning could provide innovative results to vendor organizations [19], [20], [21]. Users are complete involvement of users to implementation stage is 35 percent in Finnish enterprises and 2 percent for Turkish enterprises. If the average scores are considered, which are 4.25 (Finland) and 3.12 (Turkey), companies are observed to differ in the level of user involvement. In Turkish enterprises this ideology is supported by a critical success factor which is software customization, while it is supported by project team composition/team skills in Finnish enterprises. It is stated that successful ERP implementations are generally result of minimal customization [22] as it is usually associated with increased information system costs, longer implementation time, the inability to take advantage from vendor software updates [23]. This factor can also be evaluates as a reason for having less success in the implementations.

Furthermore, considering the module order evaluated by companies, several ideas can be obtained about their perspective about ERP. For Turkish enterprises it is obvious that ERP is used in order to control financial transactions in the first place for produced and sold items in addition to keeping records about human resources. In Finnish case,

it is obvious that quality and production planning modules have higher importance than finance. It can be concluded that, as transactions that can be conducted by other software are default in ERP system, implementation of the modules that are unique to ERP has higher importance for Finnish companies. In addition to that, this perspective increase their usage success and functional fulfilment ratio.

In conclusion, the results of this study show how several factors that effect the implementation success of ERP. Hence, deeper studies are required to better understand these factors. The outcomes of the research are expected to provide a roadmap for enterprises to have successful implementations and inspire future researches about implementation process.

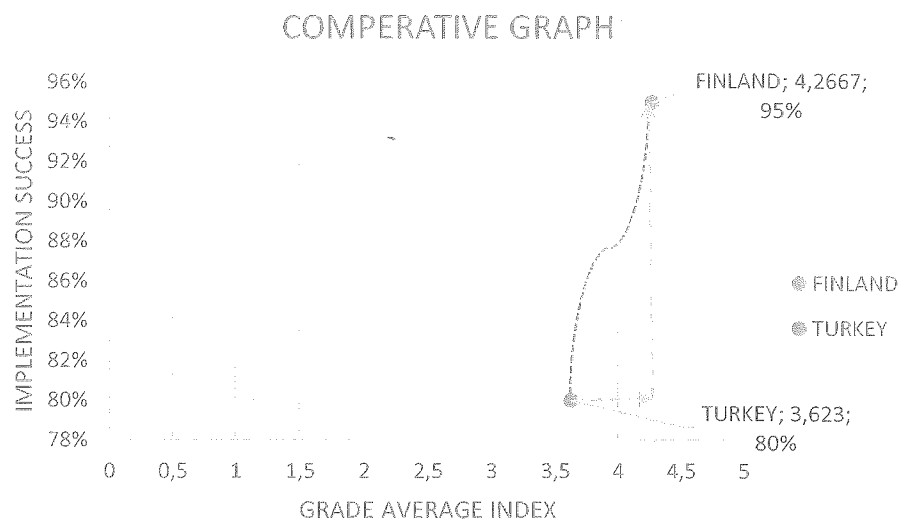


Figure 5.1 Comparative Implementation Success Graph

This graph can be seen as the roadmap to reach successful implementation with optimal resource usage. The grade average index axis of the graph is obtained by getting averages of the scores collected from companies in the survey by questions from 9.3 to 14. For Turkish enterprises it is founded out to be 3,623 and for Finnish enterprises t turned out to be 4,667. For the implementation success axis, sums of the completely successful and neutral implementations are divided over ERP implemented companies from the survey presented in the beginning of research methodology. It is 95 percent for Finnish companies and 80 percent for Turkish companies. The status of Turkish enterprises in implementations was founded to be less successful. For any

company that is in this case, game is not over. The implementation success can be shifted by moving right in the y-axis which is combination of the dimensions:

- Top management support
- Effective project management
- Business process reengineering
- User involvement
- Education and training

Improvement on these dimensions is predicted to support the increase in the success of the implementation. In order to increase the ratings of these dimensions, in addition to monitoring the common critical success factors, controlling the regionally differing critical success factors determined by the survey can be useful which are:

- Following formal methodology/ERP implementation strategy
- Project team compositions and interdepartmental corporation
- Software customisation
- Education and Training on Software
- Management support and commitment

Seeking for a great differences in ratings of regional critical success factors led us to capture a point. Although it is not listed in the table Management support and commitment is rated as 46 percent important for Turkish companies which makes it twelfth most rated critical success factor of Turkey. It can be concluded that it is also a common critical success factor.

Finnish companies' strategy to bond consultancy to their company inspite of outsourcing, which can effect and be evaluated under both project team composition and education and training. Besides, high level of customisation on ERP software seemed to decrease implementation success. Management support and commitment is also an important factor. It is effective for resistance to change by internal customers. Dealing with their problems and convincing them to change can be considered under this topic.

In order to keep these parameters under control, continuous feedback loop should be provided between all elements of the system (company), which will lead them to

continuous maintenance and improvement. This feedback loop acts like a corrective action requirement alarm for possible bottlenecks and problems in the project transactions. It also functions as information provider about current status of the system. Providing interrelation between dimensions of balanced scorecard methodology, which are finance, learning and growth, internal business process and customer, during implementation, is expected to lead the company to the demanded result. By the achieved know-how, there will be prepared infrastructure of the future projects or maintenances about system.

Considering the project execution, additional actions during the ERP project, parallel to ERP implementation, should be applied in the following steps:

Step 1 - ERP Project Start and Execution: In addition to actions listed in the literature survey, the project execution strategy should be set considering Balanced Scorecard dimensions. Hofstede's comparison can be taken into account to determine possible regional performance metrics, as it provides information about prioritised goals of the businesses considering their nations.

Step 2- Planning: During the scheduling, dates of reaching some certain goals that are planned to be achieved can be presented in order to motivate team members and management. Motivation of management is important to provide stronger management commitment which will provide ease of project flow. In addition to that, required managerial competences of project leaders should be stated in order to eliminate possible bottlenecks during implementation as a preventive action.

Step 3 - Implementation and Control: Considering the size of the company one of the three implementation types, which are slam-dunk, franchising and the big bang, can be selected.

Step 4 – Controlling: By controlling the KPIs determined in the beginning, the control step can be conducted more precisely. Observing possible changes in certain parameters, corrective actions may be done more quickly. This will improve system agility.

Step 4 - Closing: Maintain and support actions should be continuously taken. The feedback loop mentioned, should be working in order to increase proactivity of the

firm. Chaos theories can be generated and the system movement plan for certain cases can be presented.

This study has been conducted on industrial management field. Determining critical success factors regionally, was useful to understand how to reach complete utilization of implemented ERP system. It is proved that vision of the companies have direct effect on implementation accomplishment. For the future work, researchers can capture data of companies from countries having lower implementation success ratios and test the stated critical success factors or they can examine new ones due to the regional difference.

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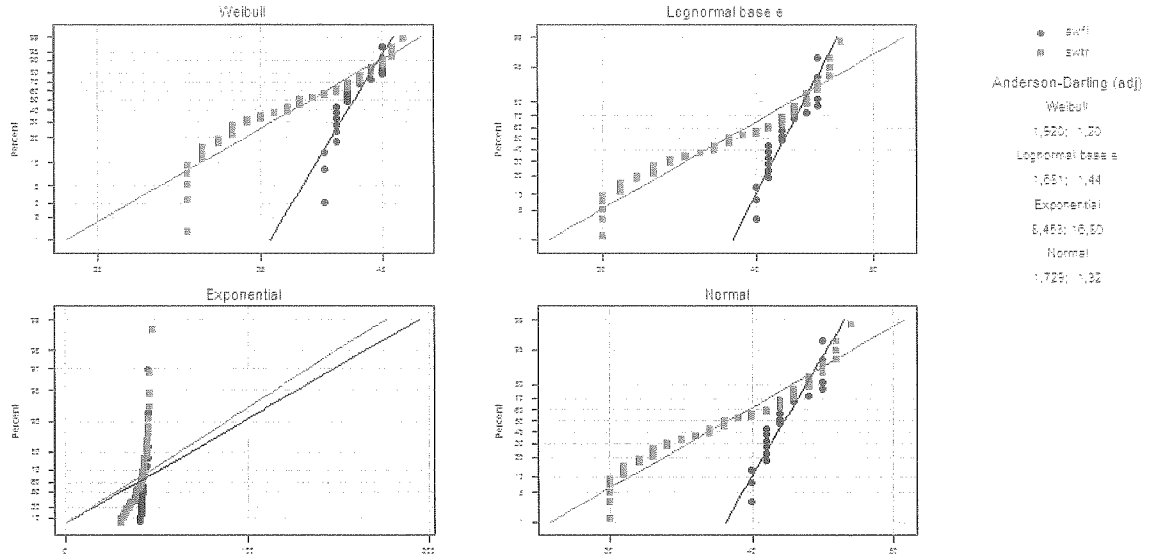
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APPENDICES

APPENDIX A

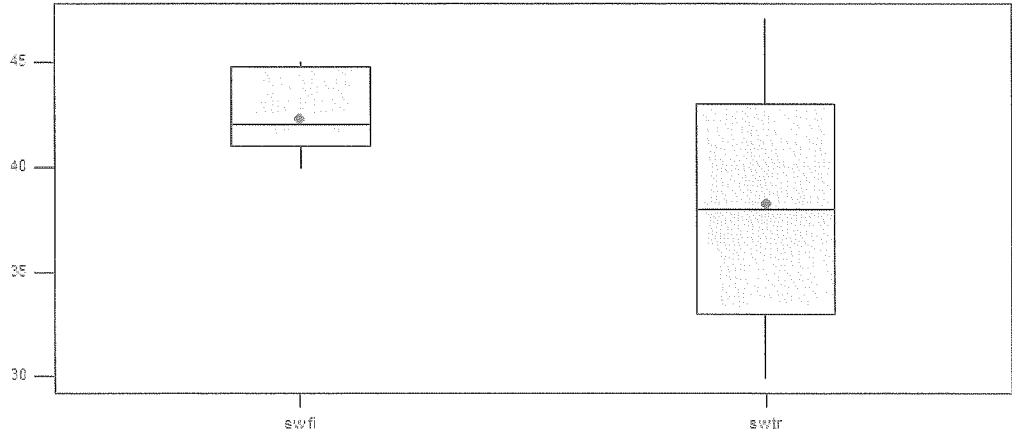
Four-way Probability Plot for swfi-swtr

ML Estimates - Complete Data



Boxplots of swfi and swtr

(means are indicated by solid circles)



Software Difference

Two-sample T for swfi vs swtr

	N	Mean	StDev	SE Mean
swfi	20	42,30	1,87	0,42
swtr	50	38,26	5,44	0,77

Difference = μ swfi - μ swtr

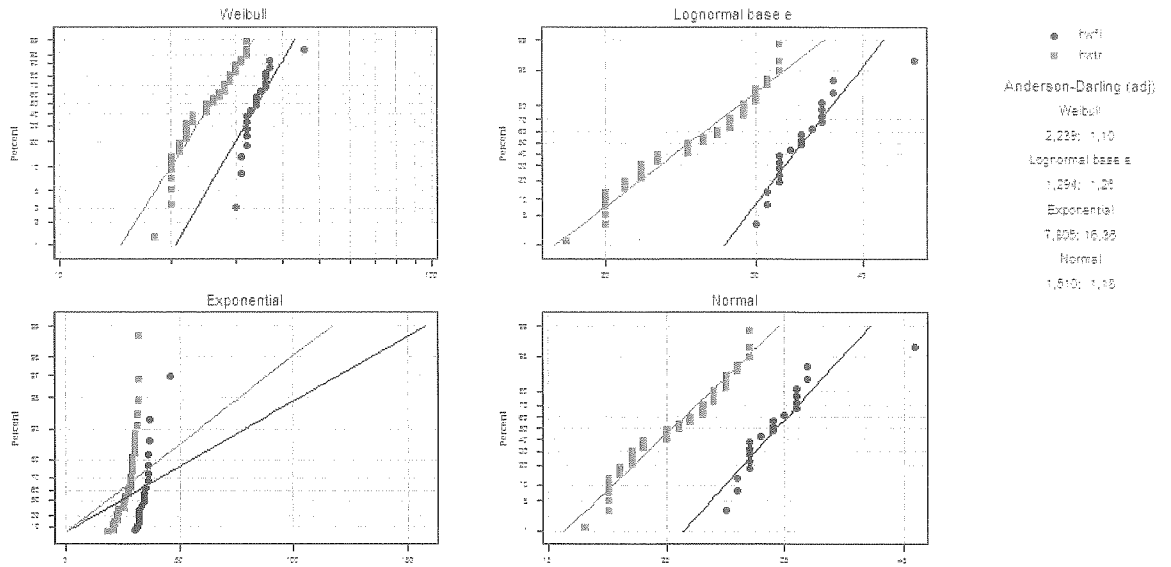
Estimate for difference: 4,040

95% lower bound for difference: 2,561

T-Test of difference = 0 (vs >): T-Value = 4,62 P-Value = 0,000 DF = 67

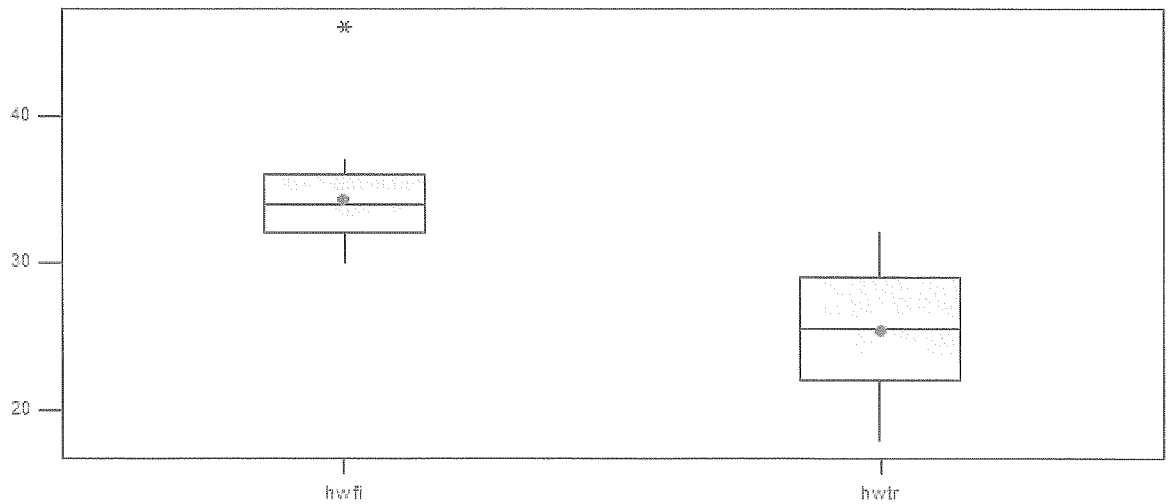
Four-way Probability Plot for hwfi-hwtr

ML Estimates - Complete Data



Boxplots of hwfi and hwtr

(means are indicated by solid circles)



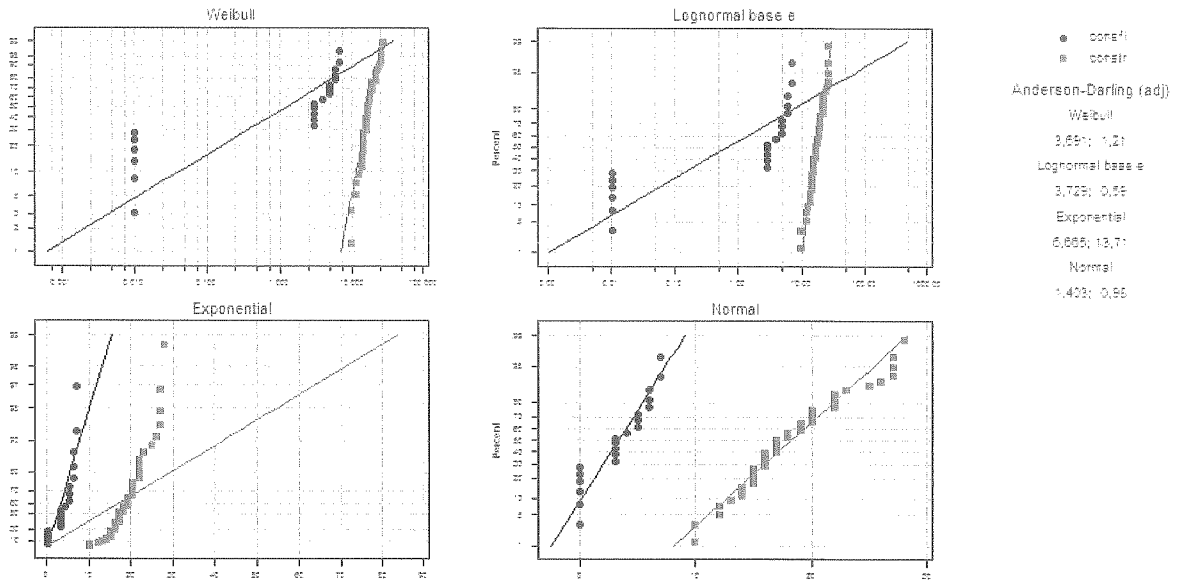
Hardware Difference

	N	Mean	StDev	SE Mean
hwfi	20	34,30	3,50	0,78
hwtr	50	25,44	3,95	0,56

Difference = mu hwfi - mu hwtr
 Estimate for difference: 8,860
 95% lower bound for difference: 7,241
 T-Test of difference = 0 (vs >): T-Value = 9,22 P-Value = 0,000 DF = 39

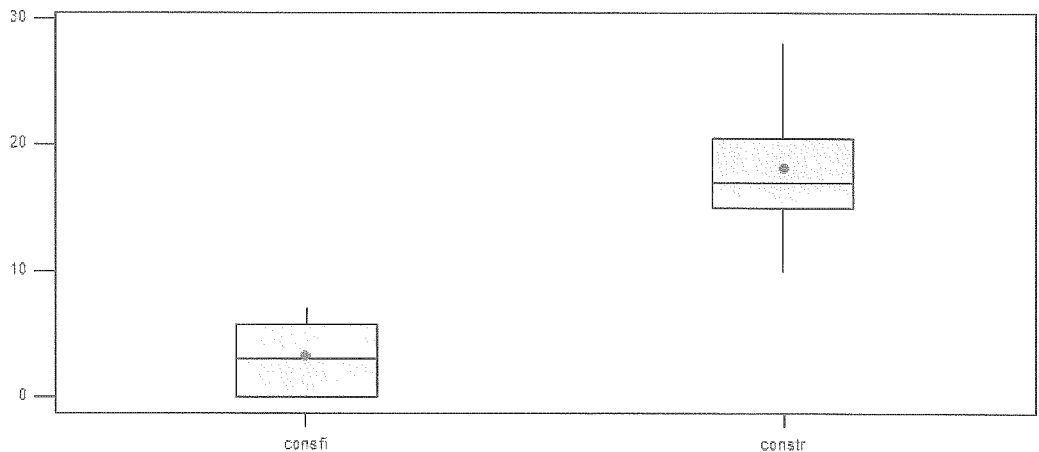
Four-way Probability Plot for consfi-constr

ML Estimator - Complete Data



Boxplots of consfi and constr

(means are indicated by solid circles)

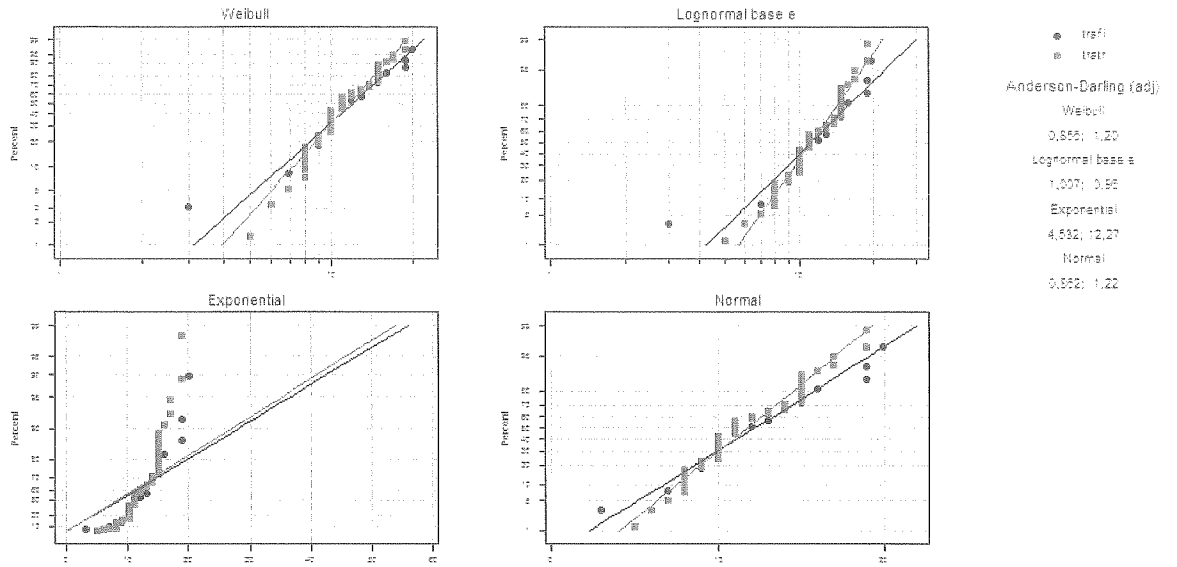


Consultancy Difference

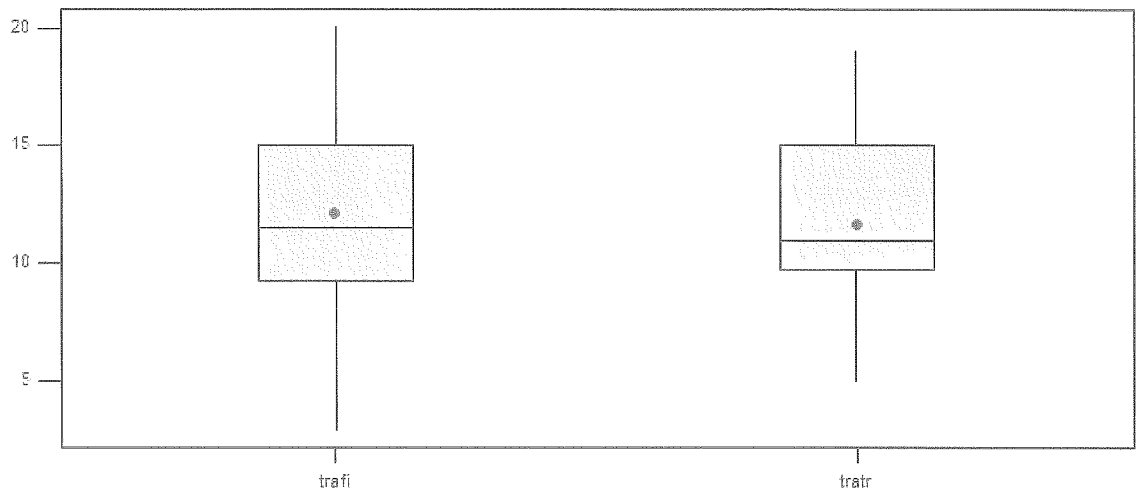
	N	Mean	StDev	SE Mean
consfi	20	3,30	2,56	0,57
constr	50	18,20	4,38	0,62

Difference = mu consfi - mu constr
Estimate for difference: -14,900
95% upper bound for difference: -13,491
I-Test of difference = 0 (vs <): I-Value = -17,68 P-Value = 0,000 DF = 58

Four-way Probability Plot for trafi-tratr
ML Estimates - Complete Data



Boxplots of trafi and tratr
(means are indicated by solid circles)



Training Difference

	N	Mean	StDev	SE Mean
trafi	20	12,15	4,34	0,97
tratr	50	11,70	3,30	0,47

Difference = μ trafi - μ tratr

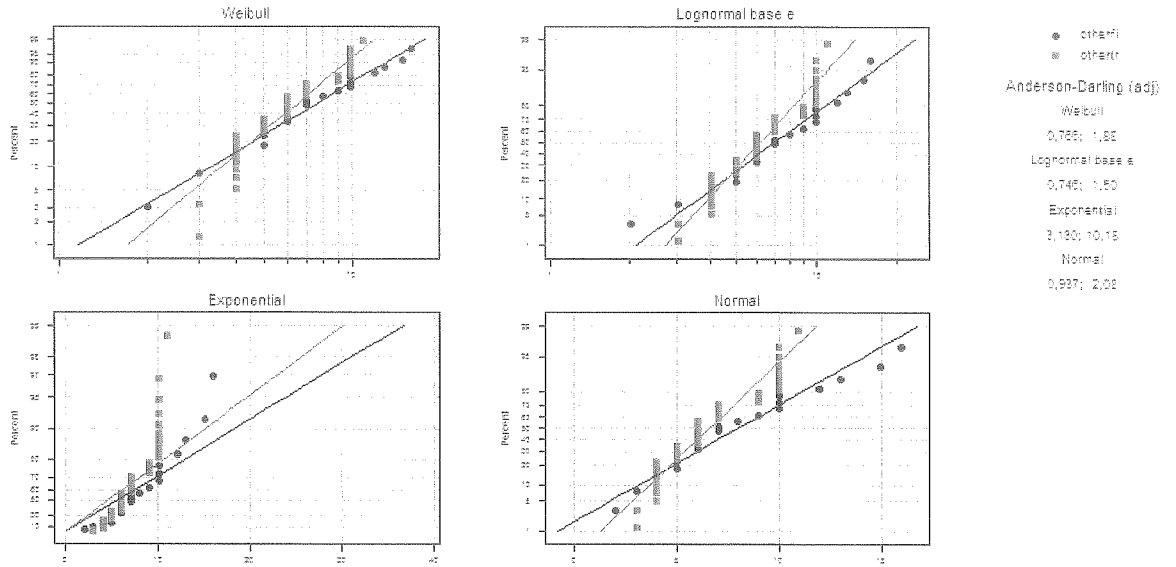
Estimate for difference: 0,45

95% lower bound for difference: -1,38

I-Test of difference = 0 (vs >): I-Value = 0,42 F-Value = 0,340 DF = 28

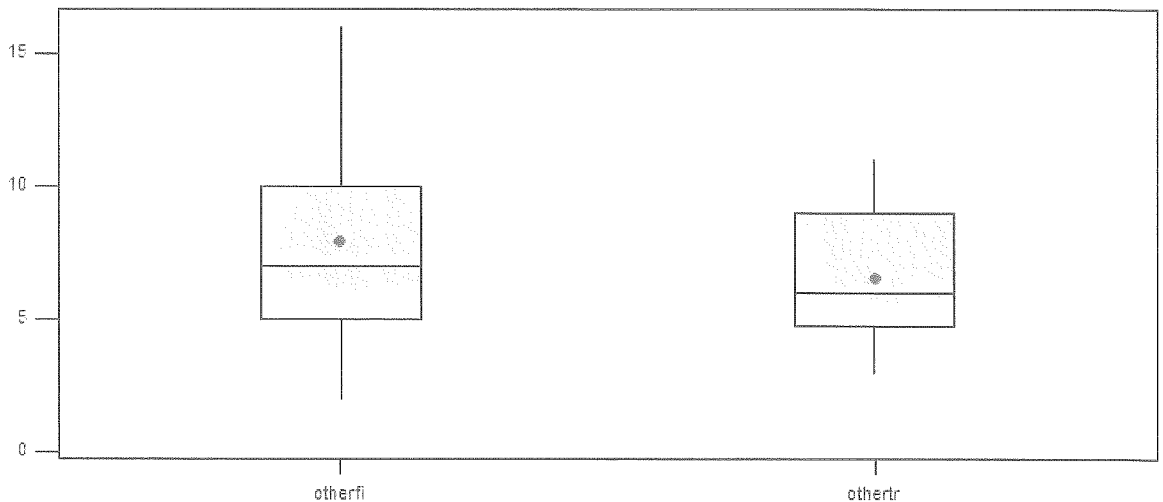
Four-way Probability Plot for otherfi-othertr

ML Estimates - Complete Data



Boxplots of otherfi and othertr

(means are indicated by solid circles)



Other Costs Difference

	N	Mean	StDev	SE Mean
otherfi	20	7,95	3,87	0,87
othertr	50	6,56	2,30	0,33

Difference = mu otherfi - mu othertr

Estimate for difference: 1,390

95% lower bound for difference: -0,193

T-Test of difference = 0 (vs >): T-Value = 1,50 F-Value = 0,073 DF = 24

APPENDIX B

Mann Whitney test

T1:1275

T2:210

Tx: 1275

N1:50

N2:20

NX: 50

Critical u value for a 50, 20 sample =348

$$U = N1 * N2 + NX * [(NX + 1) / 2] - TX$$

$$1000 > 348$$

There is no significant difference.

CRITICAL VALUES OF U FOR TWO-TAILED TEST AT 0,05

		N1									
		+-----									
N2		50	51	52	53	54	55	56	57	58	59
		-----+									
20		348	355	363	370	378	385	393	400	408	415
21		368	376	384	392	400	408	415	423	431	439
22		388	397	405	413	422	430	438	447	455	463
23		409	417	426	435	444	452	461	470	479	487
24		429	438	447	457	466	475	484	493	502	512
25		449	459	469	478	488	497	507	517	526	536
26		470	480	490	500	510	520	530	540	550	560
27		490	501	511	522	532	543	553	564	574	585
28		511	522	532	543	554	565	576	587	598	609
29		531	542	554	565	577	588	599	611	622	634

APPENDIX C

SURVEY QUESTIONARE

1. What is the Enterprise Resource Planning system (ERP) that your company is using now?

2. What system did you use before that?

3. When did you start using the new ERP system?

4. How many months was the ERP implementation planned to take?

5. How many months did the implementation actually last?

6. How many ERP modules were implemented?

7. Would you please make an estimate of the original budget established for the ERP project?

8. Would you please make an estimate of the following cost categories actually incurred in your ERP implementation?

CATEGORY	PERCENTAGE EVALUATION (%)
Software license	
Hardware Implementation	
Consultants	
Training	
Other costs	

9. Please rate the degree of your agreement with the following statements. (1= Least-5= Highest)

9.1.The ERP implementation has been completed within budget.

1	2	3	4	5
---	---	---	---	---

9.2.At the present moment, the ERP system is successfully used.

1	2	3	4	5
---	---	---	---	---

9.3.The required functionality of the ERP system was fulfilled.

1	2	3	4	5
---	---	---	---	---

10. Top management support refers to the fact that the ERP project needs to receive approval from top management. Please rate the level of top management support for your ERP project (1-5 scale)

1	2	3	4	5
---	---	---	---	---

11. The effective project management refers to the effective planning and execution of the implementation process. Please rate the level of effectiveness of the project management of your ERP implementation. (1-5 scale)

1	2	3	4	5
---	---	---	---	---

12. Business process reengineering refers to aligning the company business processes with the ERP software that will be implemented. Please rate the degree of business process reengineering for your ERP project. (1-5 scale)

1	2	3	4	5
---	---	---	---	---

13. Education and Training refer to the introduction of the ERP concepts to the future users, and to providing training with regard to the features of the ERP software. Please rate the level of education and training in your project. (1-5 scale)

1	2	3	4	5
---	---	---	---	---

14. User Involvement refers to the users' participation in the development and implementation of the ERP system. Please rate the level of user involvement in your ERP project. (1-5 scale)

1	2	3	4	5
---	---	---	---	---

15. Please indicate the main industry in which your company is operating.

16. Please put the following modules of ERP system in to an importance order for your company.

Human Resources		Production Planning	
Finance		Manufacturing	
Sales and distribution		Purchase	
Supply Chain		Inventory	
Plant Maintenance		Quality Management	

17. Please select the top 10 critical success factors for ERP implementation from the list below.

Good project scope management	Managing consultants
Management expectations	Software customisation
Project management	Training on software
Steering committee	Vendor support

Cultural change/political issues	Formal methodology- ERP implementation strategy
Business process reengineering (BPR)	Adequate ERP software selection
Adequate resources	Clear goals and objectives
Trust between partners	Empowered decision makers
Interdepartmental cooperation	Management support and commitment
Project team composition/team skills	