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MASTER'S THESIS

PROJECT PLANNING PRACTICES BASED ON ERP PROJECTS IN SMEs- A CASE STUDY OF R. MACEDONIA

Ljubljana, February 2013 FROSINA TASEVSKA

AUTHORSHIP STATEMENT

The undersigned Frosina Tasevska, a student at the University of Ljubljana, Faculty of Economics, (hereafter: FELU), declare that I am the author of the master's entitled Project Planning Practices Based on ERP Projects in SMEs- Case Study of R.Macedonia, written under supervision of prof. Talib Damij.

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INTRODUCTION

Information technologies (hereinafter: IT) have revolutionized all aspects of our living. The business and management community could not remain untouched. They had to embrace the benefits that IT was bringing if they wanted to stay competitive on the market. Major changes had to be introduced, one of them being the abandonment of the old functional organizational structures. Companies started focusing on the business processes that cut across several functions. In order to deal successfully with this type of situation, companies needed information systems that would combine all the functions into a single unit and that would bring all the information into one place (Leon, 2008, p. 7). Enterprise Resource Planning (hereinafter: ERP) systems were developed to deal with this issue. They comprise all the techniques and practices that enable integration of all business processes with the end result being the efficient deployment of resources and the effective management of the whole enterprise (Leon, 2008, p. 25).

The implementation of such systems is certainly not an easy task. It requires companies to commit significant amount of resources and implement a large scale change that will affect every aspect of the functioning of the company (Kumar, Maheshwari, & Kumar, 2002, p. 510). This causes many companies to experience difficulties which results in their ERP systems being implemented late or over budget. IT project management is essential in these cases to help companies cope with these issues and overcome the difficulties. By planning, organizing and managing resources, it helps companies to successfully fulfill their ERP project goals and objectives.

The importance of IT project management practices has been acknowledged by many researchers when identifying the Critical Success Factors (hereinafter: CSFs) of ERP implementations. One extensive study of Dezdar and Sulaiman (2009, p. 1044) in which they reviewed 95 previously published articles, identifies 17 CSFs of ERP implementation. Project management is one of the CSFs that companies should pay distinctive attention to. It has been cited in 70% of the reviewed literature, only slightly less than Top management support and commitment which was cited in 72% of the articles.

Usually when companies buy ERP solutions from globally recognized vendors such as SAP or Oracle, they follow the implementation methodology of the vendors, and use their consultants and best practices. However the importance of general IT project management should not be undermined, especially when companies such as those from Macedonia, buy solutions from vendors that have not developed their own implementation methodology.

IT project management involves the application of a variety of skills, tools and techniques. By applying these skills, project teams can successfully manage each stage of the project: project initiation, project planning, project execution, and project closure. Managing these stages on an IT project can become even more challenging because of the continuous improvements that technology is introducing.

Project planning has been recognized as one of the most important of the aforementioned stages within the project life cycle. Careful planning, according to Little (2011, p. 36), is one of the principles that must be followed in order to implement projects successfully. Many IT projects fail at the beginning rather than at the end, because of insufficient planning (Phillips, 2011). Good planning is in fact halfway to success. Therefore, the implementation of ERP systems should also first start with the planning of the system, before addressing the higher stages (Shanks, Seddon, & Willcocks, 2003, p. 199). According to Marchewka (2002, p. 13), the project plan should provide answers to the following questions:

- What are we going to do?
- Why are we going to do it?
- How are we going to do it?
- Who is going to be involved?
- How long will it take?
- How much will it cost?
- What can go wrong and what can we do about it?
- How did we estimate the schedule and budget?
- Why did we make certain decisions?
- How will we know if we are successful?

These main planning practices have been identified by researchers when defining IT project management as one of the CSFs of ERP implementations. For example, Ngai, Law and Wat (2008, p. 555) conducted a literature review on CSFs in the implementation of ERP across 10 different regions. When speaking about project management, they say that a clear and defined project plan including goals, objectives, strategy, scope, schedule, and so forth was frequently cited CSFs for ERP implementation in almost all of the regions and countries examined in their study. According to Ngai et al., it is very important that the company defines unambiguous goals and ensures that everybody in the organization understands them. The scope should also be precisely defined if scope creep is to be avoided. Clear and reasonable milestones should be defined in order to avoid increasing costs or delaying the implementation. All activities should be planned and synchronized among all interested parties. Communication should also be planned and maintained throughout the process (Nah & Delgado, 2006, p. 109-110). Furthermore, ERP projects involve significant levels of risks of different types (Iskanius, 2009, p. 271). They should be taken into account and appropriate mitigation strategies and contingency plans should be developed.

Even though the ERP systems were first developed and implemented in the developed countries, companies from the developing countries are also embracing these systems. They also account for the CSFs when implementing their ERP projects. As the study of Mooheba, Asem and Jazi (2010, pp. 104-105) indicates, project management is of a similar importance for companies from both developing and developed countries.

Large companies were also the first to implement ERP systems, but as O'Leary (2002) assumes, ERP systems can benefit both large scale companies, as well as small and medium-

sized enterprises (hereinafter: SMEs). Many ERP software packages have been developed recently to suit the needs of the SMEs, specifically in terms of costs and functions scope.

Macedonian companies certainly follow the trend of implementing ERP systems; mainly lower scale ones, primarily because of resource constraints. Only a small number of companies can allow the implementation of complex software packages. Many of them implement ERP in order to improve their business processes, but some of them also to comply with the legislation requirements. Usually, only several modules are implemented, mainly for finance, inventory and accounting purposes. On the whole, these systems incur significant costs and should be planned and managed carefully if successful implementation is expected to take place. However, up until now there has been no study conducted to reveal and describe the way in which Macedonian companies manage their ERP implementations, particularly when it comes to the way they plan for this process.

These facts made me eager to explore this area more in depth and focus my Master Thesis on this topic. I assume that this study will also bring some positive value to this situation where very little research has been done on this topic and will incite more research in the future.

Therefore, the particular objectives of my study are to **1. To identify the main IT project planning practices through reviewing the IT project planning literature; 2. To determine the extent to which these practices are applied by Macedonian SMEs when they implement ERP systems;** and **3. To determine how successful the ERP implementations in Macedonian SMEs are.**

This will enable me to test my initial assumption that ***successful ERP implementation depends on implementing sound project planning practices, as suggested by the literature.*** Therefore, my primary research question for this research is **whether IT project planning has an impact on the project success of the ERP implementation in Macedonian SMEs**.

In the first part of the study, in order to provide answers to the aforementioned question, I give an overview of ERP in general which includes its definition, a brief history development, its benefits, its advantages and disadvantages, its life cycle phases and its success factors. A literature review on IT project management in general follows in the second part. The third part is dedicated to IT project planning practices. The following practices are covered in the study: development of a business case, a scope plan, a baseline plan and a risk plan. A brief overview of the importance of planning for change is also provided even though this practice is not included in the further analysis. In the fourth part I present the ERP practices in Macedonia, the methodology of the research and the main findings.

I employ a survey as a technique for primary data collection as I assume it is the most suitable for this type of combination of descriptive and explanatory research. In the initial stage, several in-depth interviews are also conducted in order to obtain detailed data about the process of ERP planning and the terminology that is used in these projects, which afterwards help me to formulate questions for a questionnaire. Both the planning and the success of the

project are measured on several dimensions. A combination of Exploratory and Confirmatory factor analysis helped me reduce the data collected through Likert-type items and enabled me to produce these dimensions. After performing this analysis, correlation and regression analysis are used in order to describe the relationship between the project planning practices and project success measures (Dvir, 2005).

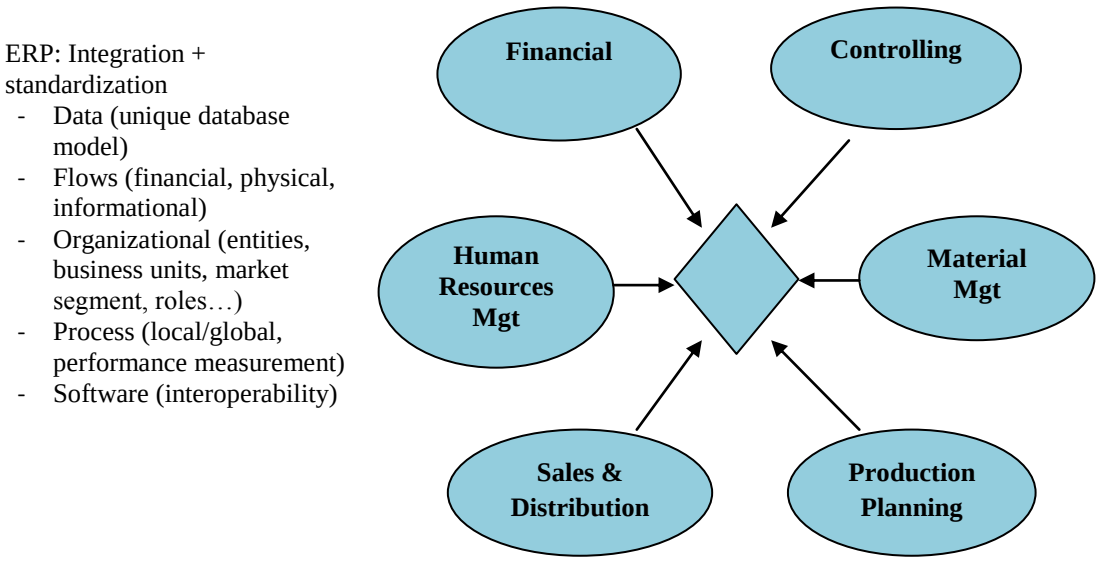
1 ENTERPRISE RESOURCE PLANNING

1.1 ERP Definition

Based on the terms that comprise the word ERP (enterprise, resource and planning) a loose definition of these systems can be stated as follows: *ERP are systems or software solutions that help companies achieve their business goals by planning their resources*. Nevertheless, as Botta-Genoulaz and Millet (2006) indicate, ERP is definitely about enterprise and focuses on resources, but it goes beyond planning and also includes other tasks such as financial control, operation management, analysis and reporting, and routine decision support.
The literature contains various definitions of ERP. Some of those that were identified during the literature review are as follows:

- "ERP is about techniques and concepts for integrated management of businesses as a whole from a viewpoint of effective use of management resources to improve the efficiency of enterprise management" (Leon, 2008, p. 14).
- "ERP is a software package that attempts to integrate all departments and functions of a company onto a single computer system that can serve all different departments' needs" (Botta-Genoulaz & Millet, 2006, p. 202) as shown in Figure 1.

Figure 1: ERP Definition



Source: V. Botta-Genoulaz & P.-A. Millet, *An investigation into the use of ERP systems in the service sector*, 2006, p. 203.

- “ERP is the method of integrating various functional systems of a large organization into a single system” (Glenn, 2008, p. 17).
- “ERP is an integrated information system that serves all departments within an enterprise. It can include software for manufacturing, order entry, accounts receivable and payable, general ledger, purchasing, warehousing, transportation and human resources” (PC Magazine, 2012).
- “ERP systems are integrated, enterprise-wide, packaged software applications that impound deep knowledge of business practices accumulated from vendor implementations in many companies” (Shang & Seddon, 2000, p. 1005).

Some of the definitions focus more on the business side of ERP by defining it as a concept or method for better management of the enterprise, whereas other emphasize its technological features by saying that it is primarily a software package that enables the company to integrate its information flows and business processes.

It seems that both views are valid and that business and technological sides cannot be stringently separated. It is definitely a technological, software solution that enables inter-departmental cooperation, but in order to be implemented practically it requires some “softer” issues to be taken into consideration as well, such as changes in the organizational culture; changes in the way people work, communicate and collaborate; and adjustment or changes of current business processes. The last mentioned issue is very important, since as Scheer and Habermann (2000, p. 58) indicate, ERP implementation should include analysis of current business processes and should consider their reengineering in order to avoid the deployment of a system that will make only the best of bad processes. Furthermore, ERP is much more than introducing an additional IT tool; it is a decision on how to shape the organizational business (Kumar et al., 2002, p. 510).

The software has a modular approach: it is built from different types of modules, each corresponding to a certain function or a business process, so that companies can decide how many of them they want to buy and implement. In that way they can purchase only modules that exactly suit their needs in terms of the processes they run. These modules usually include best practices as experienced by the vendors.

1.2 ERP History Development

The predecessor systems of ERP can be tracked back to the 1960s when companies were still operating in the era in which the costs were the primary concern and were considered as a major competitive advantage. These orientations lead to product-focused manufacturing strategies that were founded on high-volume production and cost minimization; they assumed stable, predictive economic conditions. During this period, newly computerized reorder point (ROP) systems were introduced that satisfied the basic manufacturing planning and control needs of these companies (Jacobs & Weston, 2007, p. 358).

The real predecessor system of ERP that occurred during the period of the 1960s is the one that resulted from the joint efforts of C.I. Case, the manufacturer of tractors and construction machinery, and IBM. Their initial idea was to create a software solution for the planning and scheduling of materials for complex manufactured products. Therefore it was called, **Material Requirements Planning** or MRP (Madu & Kuei, 2005, p. 3) or **Material Resource Planning** (Sudalaimuthu & Anthony Raj, 2009, p. 364). It was a system that enabled the following questions to be answered:

- What products are going to be made?
- What are the materials needed to make these products?
- What are the materials that are presently available in stock?
- What are the items that need to be purchased?

By using the master production schedule (hereinafter: MPS), the bill of materials (hereinafter: BOM) and the inventory records, it provided answers to the aforementioned questions (Leon, 2008, p. 18).

The advances in technology and the addition of modules and capabilities led to the introduction of the term **Manufacturing Resource Planning** or MRP II that referred to systems that aimed to improve the entire plant operation. These systems appeared in the early 1980s and offered lower cost alternative to the mainframe computers by providing flexible disk drives with capacities that were appropriate for small and medium sized companies (Jacobs & Weston, 2007, p. 359). They contained the following additional capabilities: sales and operational planning, financial interface and simulation capabilities (for better decision making). It therefore offered a method for effective planning of all the resources of a manufacturing company (Leon, 2008, p. 19).

In 1990' the MRP II systems were extended and new functional areas were added such as: product design, information warehousing, material planning, communications, finance, human resources and project management. This has led to the evolution of ERP systems that encompassed all activities of an enterprise. Thereby they can be considered as a natural extension of the MRP II. An ERP system integrates business activities across functional departments and may include modules such as: marketing, finance, human resources and manufacturing, to name just a few (Srivastava & Batra, 2010, p. 4).

From the 1970s till today, as Jacobs and Weston (2007, pp. 362-363) contend, little has changed in the logic associated with these types of applications. They are just executing the same logic much faster and in real-time. ERP is now in a maturity phase where everybody understands the technical, human and financial resources needed for implementation and ongoing use. Therefore, the focus will be on implementing it in as short a period of time as possible. Hereby project management issues will remain an issue, especially in the case of global implementations.

1.3 ERP Benefits

The enormous rise of companies implementing ERP systems confirms the fact that these systems bring benefits to their implementers. By integrating all information that flows within an organization they enable companies to perform effectively and efficiently, make timely decisions and gain a competitive advantage over the other players on the market. As Lozinsky (1998) argues, the rewards for the companies are immense. ERP systems help companies reduce their costs and increase their return on investment, have easy access to all information within the company and make agile decisions, eliminate the need for information re-entry and thereby reduce the possibility of errors and provide reliable figures for analyzing business performance. Mohapatra (2009, p. 303) continues by saying that ERP as a business process automation tool improves productivity, mainly in two ways. Firstly, by incorporating best practices in its modules, it improves the efficiency of the existing processes; and secondly, by allowing timely retrieval of information, it improves the decision making. Mabert, Sony and Venkataramanan (2003, p. 244) in their research in the US manufacturing sector found out that benefits may differ by company size. According to Mabert et al. (2003), large companies report improvements in financial measures, but small companies report improvements in order-management, on-time deliveries and customer interactions.

Davenport (1998, p. 3) describes the benefits ERP is bringing from a slightly different point of view. This author argues that in order to understand why ERP is so attractive, one needs to understand the problem these systems are designed to solve. This problem, according to Davenport (1998), is the fragmentation of information within an organization. Large quantities of data are collected by companies every day, but they reside at separate computer systems that do not communicate between each other. Therefore they also fragment the business as a whole; for example, the sales and ordering system cannot communicate with productions scheduling, which in turn affects manufacturing productivity and customer response time.

Shang and Seddon (2000, p. 1006) developed a comprehensive framework of ERP benefits which they say can be used as a benchmark for comparing benefits across different companies. The framework is presented in Table 1.

The framework developed by Schubert and Williams (2011, p. 818) also seems very useful as its authors build on previously conducted research, address its limitations and provide a more detailed analysis of the ERP benefits. They indicate that benefits can be viewed as either expected, fulfilled or indirect, and can be grouped into four categories: “Strategy and Process”, “Resources”, “Functions (ERP Modules)” and “Technology Components”.

1.4 ERP Advantages and Disadvantages

Based on the benefits that ERP systems bring to the companies, it is easy to conclude that ERP implementation has numerous advantages (Ali & Hasan, 2010, p. 21; Leon, 2008, p. 3; O’Leary, 2002, p. 163). It promotes business integration by integrating company’s

information systems, eliminating information asymmetries and enabling access to real-time information. This is of a great advantage since it enables companies' users to better plan, analyze and control their activities, and to make better and more informed decisions. ERP systems also promote organization standardization across different locations and facilitate intra-organization collaboration as well as inter-organizational communication by providing database access to partners for procurement purposes, for example. Another big advantage of ERP systems is that they are very flexible in covering diverse multinational environments such as language, currency or accounting standards. They also include best practice of business process and follow the latest trends in IT, including open systems, client/server technology, Internet/Intranet, e-commerce, etc. ERP systems also include security features to protect them from outsider or insider crime, such as embezzlement.

Table 1: Proposed ERP Benefits Framework

Dimensions	Sub dimension
1. Operational	1.1 Cost reduction 1.2 Cycle time reduction 1.3 Productivity improvement 1.4 Quality improvement 1.5 Customer service improvement
2. Managerial	2.1 Better resource management 2.2 Improved decision making and planning 2.3 Performance improvement
3. Strategic	3.1 Support business growth 3.2 Support business alliance 3.3 Build business innovations 3.4 Build cost leadership 3.5 Generate product differentiation (including customization) 3.6 Build external linkages (customers and suppliers)
4. IT infrastructure	4.1 Build business flexibility for current and future changes 4.2 IT costs reduction 4.3 Increased IT infrastructure capability
5. Organizational	5.1 Support organizational changes 5.2 Facilitate business learning 5.3 Empowerment 5.4 Build common vision

Source: S. Shang & P. B. Seddon, *A Comprehensive Framework for Classifying the Benefits of ERP Systems*, 2000, p. 1006.

ERP enables role-based access where level of access is assigned to each user of the system based on his/her needs for information (Mohapatra, 2009, p. 307). For example, certain information is available for the general public, customers have access to information they need through customers' portal, and managers have access to more detailed information vital

for the company's everyday functioning. It also enables the creation of documents for statutory and business purposes, such as documents for legal authorities, for audit purpose as well as for daily business activities (purchase orders, invoicing, goods recipe note, etc.). It provides them in a user friendly manner and enables easy modification to users that have appropriate authority.

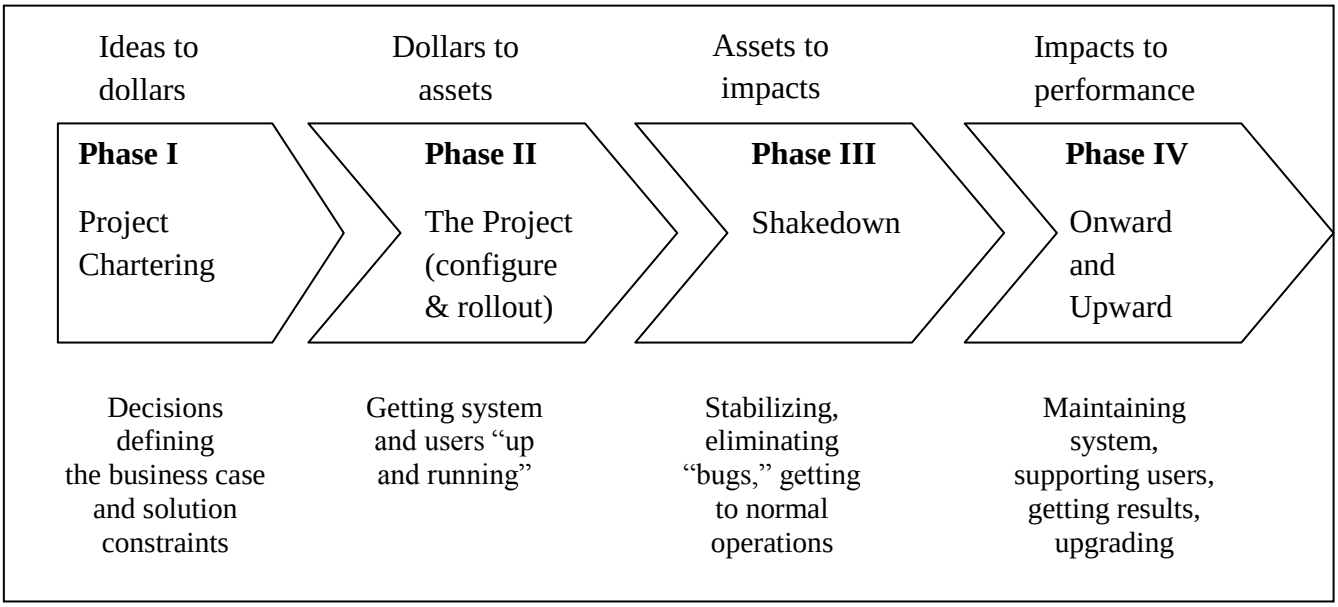
Ali and Hasan (2010, p. 164), Greengard (2003, p. 68) and Sharma (2004, pp. 9-10), on the other hand, agree that ERP systems do have certain disadvantages associated with them, apart from the many advantages they bring to the companies. Some of them are as follows:

- The costs associated with the implementation of the ERP systems can be very high. They include the costs of the hardware and software itself, but also other costs that can be even higher than these direct ones, such as the costs needed to train the employees to use the system and educate partners about its capabilities. Furthermore, the system requires testing, customization, maintenance, upgrades and consultants; these costs are often overlooked by the companies. In order to reduce the direct costs and satisfy the needs of the smaller companies as well, many ERP vendors are now selling "lighter" solutions that cost less (McGabe, Aggarwal & Davis, 2011, p. 13).
- The implementation time can last from 12 to 18 months, and the time for real benefits to occur, can take a few more years.
- The need to reengineer the process in order to fit the best practices prescribed by the ERP vendor may lead to a loss of competitive advantage.
- The process of adapting ERP to specific company's processes is many times seen as very difficult and comes with additional costs. But as Mabert et al. (2003, p. 241) discovered, most of the companies they surveyed undertook some form of customization.
- The switching costs after the implementation are very high for any of the partners involved in the system. This forces companies to stick with these systems for several years, makes them dependent on the vendors and reduces their flexibility and strategic control at corporate level.
- Because ERP systems create a type of a "boundaryless" organization, this may cause problems in accountability, lines of responsibility and employees morale.
- Departments can be resistant in sharing internal information and therefore reduce the benefits of the integration.

1.5 ERP Implementation Life Cycle

The ERP implementation is a big undertaking for any company and usually follows certain steps or phases. Many authors have described the life cycle of the ERP system using different approaches. Nevertheless, the framework described by Marcus and Tanis (2000, p. 189) appears to be the most suitable (see Figure 2).

Figure 2: Enterprise System Experience Cycle



Source: M. L. Marcus & C. Tanis, *The Enterprise System Experience- From Adaptation to Success*, 2000, p. 189.

This framework was one that other authors referred to the most, some of them being Staehr (2010, p. 214), Hakkinen and Hilmoli (2008, p. 291), Kumar et al. (2002, p. 513) and Nah and Delgado (2006, p. 104). Marcus and Tanis (2000) believe that the ERP implementation can be broken up into four phases: project chartering, the project (configure and rollout), shakedown, and onward and upward, as presented in Figure 2.

According to Marcus and Tanis (2000, p. 189), the first phase encompasses decisions that lead towards the funding of an enterprise system. The key activities at this stage are: building business case for the enterprise system, selecting software package, identifying a project manager, and approving budget and schedule. The project phase, as these authors argue, includes activities such as software configuration, system integration, testing, data conversion, training, and rollout. In the third phase the organization gets used with the ERP system. This phase can be considered as finished when the organization starts to function normally, or in a bad case scenario, when the company gives up and disinstalls the system. At this point the project team usually passes the control to operation managers and end users. Key activities comprise bug fixing and rework, system performance tuning, retraining and staffing up to handle temporary inefficiencies. Usually the errors made at the previous stages are felt at this point in the form of reduced productivity or business disruption, for example. It may also happen that the system becomes too reliable on the project team and it does not integrate successfully the end users that should actually benefit mostly out of it. If the company succeeds to "survive" the shakedown phase, it continues in the onward and upward phase with normal operation until the system is upgraded or replaced with a new one. At this stage the company is able to assess whether the system has justified the investment by looking at the benefits that it has brought. Some of the activities at this phase are system maintenance, providing of support to users, obtaining results and upgrading the system (Srivastava & Batra, 2010, p. 22).

As it can be seen in section 2.4, these phases of ERP implementation correspond to some extent to the project life cycle phases. It is not a chance correspondence, since the ERP implementation is indeed a project undertaking and follows the project principles as well. The project chartering phase corresponds very much to the planning phase of the project where all the critical decisions for the actual implementation of the ERP system are made. It is described in more detail in section 3 as it is the main focus of this study.

1.6 ERP Critical Success Factors

The ERP implementation, as mentioned before, is a complex undertaking that has also many disadvantages and many times fails to deliver its promises. As Zhang, Lee, Huang, Zhang and Huang (2005, p. 57) say, by referring to the Standish Group report on ERP implementation projects, these projects were on average 178% over budget, took 2.5 times as long as intended, and delivered only 30% of the promised benefits. Therefore it is logical to conclude that there must be some factors that critically influence the implementation process and help the company to achieve its goals while implementing the ERP solution successfully. Dezdar and Sulaiman (2009, p. 1044) reviewed 95 journal articles on this topic, published within the period of 1999 to 2008, and developed a systematic compilation of CSFs that consists of 17 broad categories, as presented in Table 2.

Table 2: ERP Projects' Critical Success Factors

Critical success factors			
1	Top management support and commitment	2	Vendor support
3	Project management and evaluation	4	Software analysis, testing and troubleshooting
5	Business process reengineering and minimum customization	6	Project champion
7	ERP team composition, competence and compensation	8	Careful selection of ERP software
9	Change management programme	10	Use of consultant
11	User training and education	12	Appropriate IT and legacy systems
13	Business plan and vision	14	System quality
15	Enterprise-wide communication and cooperation	16	User involvement
17	Organizational culture		

Source: S. Dezdar & A. Sulaiman, *Successful enterprise resource planning implementation: taxonomy of critical factors. Industrial Management & Data Systems*, 2009, p. 1044.

All of these factors were previously used in the study of Nah, Zuckweiler and Lau (2003, p. 16) whereby they surveyed chief information officers from Fortune 1000 companies in order to identify their perceptions on CSFs in ERP implementation. They have found out that for them, the most important factors are top management support, project champion, ERP teamwork and composition, project management, and change management program and culture.

Zhang et al. (2005, p. 61), in their study of factors that affect ERP implementation in China, have developed a framework that consists of four groups of factors: Organizational Environment, User Environment, System Environment and ERP Vendor Environment. Effective Project Management is part of Organizational Environment.

In the study conducted by Ngai et al. (2008, p. 551), the "Clear and defined project plan" was one of the most cited CSFs in the 10 regions that were researched. According to these authors it should include goals, objectives, strategy, scope and schedule. Umble, Haft and Umble (2003, p. 251) agree with this by listing the poorly defined goals and deliverables, besides a poorly selected implementation team, as some of the main reasons for ERP project failures.

Nah and Delgado (2006, p. 110) while studying the CSFs during ERP implementation and upgrade have related them to the four implementation phases described by Marcus and Tanis (2000) in section 1.5. Using this approach they have found out that "Business plan and vision" and "Top management support and championship" are most important during the chartering phase. "ERP team composition", "Project management" and "System analysis, selection and technical implementation" are critical during the project phase, whereby "Change management" and "Communication" are very important during the project and shakedown phases.

Mooheba et al. (2010) have compared the CSFs between the developing and developed countries and found out that that there are not many differences between these two. Project management, involving a clear and defined project plan with 31 frequencies, was found to be more important in developed countries when compared to 26 frequencies in developing ones. Furthermore, they found out that companies in the developing countries depend more on the ERP vendor.

IT project management and specifically project planning is identified as one of the CSFs for ERP implementation in all of the aforementioned articles. This finding makes me curious to examine whether the same counts for the Macedonian ERP implementations.

1.7 ERP and SMSs

Small and medium sized companies are essential for the economic growth in any country. In the USA, small companies (less than 500 employees) account for a significant share in production and hiring. In 2008 they totaled 27.3 million, out of which approximately 6 million were employers that accounted for 49.6% of US private sector jobs. Small companies in total made up 99.7% of US employers (Small Business Administration, 2011). As Kongolo (2010, p. 2289) indicates, they represent a large portion of businesses in developing countries as well. In South Africa, they account for approximately 91% of formal business entities, contributing from 51% to 57% of the GDP and almost 60% of employment. In order to compete with the big corporations within the global market, they definitely need to support their business processes with IT solutions that will help them exercise more control, improve their effectiveness and better meet the needs of their partners and customers. Many of them

are realizing the benefits of the ERP solutions and implement them in their enterprises. As O'Leary (2002) assumes, ERP systems can benefit both large scale companies and SMEs. McGabe et al. (2011, p. 13) indicate that many ERP software packages have been developed recently to suit the needs of the SMEs, specifically in terms of costs and functions scope.

However, the implementation, as mentioned before, is not an easy task for any company; it is associated with many difficulties and costs that make the implementation of ERP in SMEs even more challenging. Malhotra and Temponi (2010, p. 35), in their study on the implementation of ERP systems in SMEs, have identified 6 critical decisions to which SMEs should pay particular attention. They are the following:

- Project team structure
- Implementation strategy
- Transition technique
- Database conversion strategy
- Risk management strategy
- Change management strategy

By interviewing six SMEs these authors have discovered the best outcome of these decisions. Regarding team structure, the best method is to assign a "heavyweight" project team, whereby the senior manager will have direct authority and control over the ERP project team; this will champion the project and its strategic importance to the business. Regarding the implementation strategies, they indicate that the "budget" strategy is most suitable for small companies, since they usually have limited resources and this strategy actually focuses on cost cutting by limiting the scope of the ERP project and eliminating consultants. The phased transition should be practiced, so that one module is implemented at a time in a sequential order. The data conversion should be done manually, instead of electronically, by the future users of the system. Some of their findings regarding risk and change management are that senior management should buy-in the users, exercise effective communication, lay-out a vision and explain the expected ERP benefits. Furthermore, they should take into consideration the initial costs of ERP implementation, as well as the subsequent costs (customizations, maintenance, upgrade costs).

Adam and O'Doherty (2000, p. 314), while studying the ERP implementation in Irish companies, have realized that the complexity of implementation of ERP projects is influenced by the complexity of the companies themselves. Therefore they conclude that the implementation for SMEs should be a shorter and cheaper task, especially if they pursue clear managerial objectives and cooperate with an experienced implementer.

Eshelman, Juras and Taylor (2001, pp. 30-33) argue that small companies should have clearly defined objectives and clear expectations of what the software should provide in order not to fall into the trap of investing in software that has greater capability and complexity than needed. They agree with Malhotra and Temponi (2010) that companies should have realistic

expectations and that everyone should understand and agree on these expectations from the start.

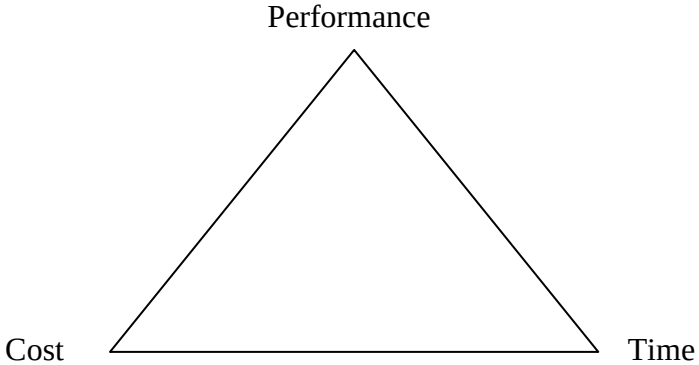
2 IT PROJECT MANAGEMENT

2.1 Project Definition

The term project can be heard very often in the business community. Companies announce new projects almost every day. This is especially true of IT businesses; whenever they have an idea about a product, hardware or software, they turn it into a project. Hence, there must be certain attributes that characterize the undertaking of a project. The definition provided by the Project Management Institute (hereinafter: PMI) (2000, p. 4) gives an idea about what distinguishes a project from the other operations of a company. The PMI defines a project as, **"a temporary endeavor undertaken to create a unique product or service"**. This definition contains two very important terms: **temporary** and **unique**. Temporary means that the project has a definitive beginning and end. Unique, on the other hand, means that the product or service that is created is different in a distinct way from all similar products or services: it is a novel undertaking, full of the unknown and accompanied by uncertainty. Even if the same project is repeated one more time, it will differ from its predecessor in one or more commercial, administrative or physical aspects (Lock, 1992, p. 3). Phillips (2004, p. 2) assumes that a project is an undertaking that falls outside of the normal operations of the company. Each project should have a defined start, a "work-breakdown structure" (hereinafter: WBS; a grid that represents all the work that has to be done within the project in an organized way) and a conclusion. If some of these components are missing, according to Massis (2010, pp. 527-528), the company's undertaking was mistakenly classified as a project.

Projects are usually constrained by date, funding and deliverables; sometimes by all of them. Martin Barnes first referred to them in 1969 (Lock, 1992, p. 8) by constructing the "iron triangle" as represented in Figure 3.

Figure 3: Triangle of Project Objectives



Source: D. Lock, *Project Management*, 1992, p. 8.

Meredith and Mantel (2012, p. 3) refer to these constraints as "direct" project objectives or goals that are common for all projects, ranging from multi-million and five year long projects to those that are small and have a new Web-site or a new software solution as an outcome, to name just a few. Lock (1992, pp. 4-8) uses the same term, project objectives, when referring to project performance, cost and time constraints: the project must first meet the goals and the purpose for which it was intended, then it should be completed within the assigned and authorized budget, and at the end it should match the planned progress in order to be completed on or before the planned date, since the well-known phrase "time is money" is as valid in project management as it is anywhere.

Lock (1992) has identified four groups of projects: 1. Civil engineering, construction, petrochemical, mining and quarrying; 2. Manufacturing; 3. IT projects and projects associated with management of change; and 4. Projects for pure scientific research. The ERP projects fall under the third category of projects as defined by this author.

2.2 Project Management Definition

Project and project management activities, according to Weaver (2007, p. 16) have existed for as long as people have set out to accomplish specific objectives with limited resources. However, these activities were not considered as projects, but as acts of worship, engineering, nation building, war, etc. As this author argues, the use of the term project and project management only became common in the period of the 1960s, and is closely related to the spread of scheduling as a discipline and the development of "project management associations", such as IPMA and PMI.

Meredith and Mantel (2012, p. 1) argue that project management emerged because of the characteristics of our contemporary society that demanded new methods of management. Apparently, three factors are particularly important: 1. the exponential growth of human knowledge; 2. the increased demand for a broad range of complex, customized, sophisticated, products and services; and 3. the emergence of global competitive markets for the production and consumption of these products and services.

Risks are ever-present in the undertaking of a project and many fail as a result of this, but project management is the discipline that can help companies predict and anticipate as many problems and risks. It permits them to plan, organize and control activities, so that the projects are completed successfully despite of all the risks associated with them (Lock, 1992). Kerimoglu, Basogly and Daim (2008, p. 26) acknowledge the importance of project management for ERP implementations in specific.

According to PMI (2000, p. 6), "**Project Management is the application of knowledge, skills, tools and techniques to project activities to meet project requirements**". They have identified nine knowledge areas that actually represent processes that may take place during the execution of a project. These are the following: Project Integration Management, Project Scope Management, Project Time Management, Project Cost Management, Project Quality

Management, Project Human Resource Management, Project Communication Management, Project Risk Management and Project Procurement Management. The tools, techniques and knowledge areas, as described in The Guide to the Project Management Body of Knowledge (hereinafter: PMBOK) published by PMI, have become a widely practiced standard in many industries around the globe (Hewagamage & Hewagamage, 2011, p. 91). Implementing these standardized practices or developing internal methodology is, according to Weaver (2007, p. 6), a key tool for successful completion of projects, programs and portfolios.

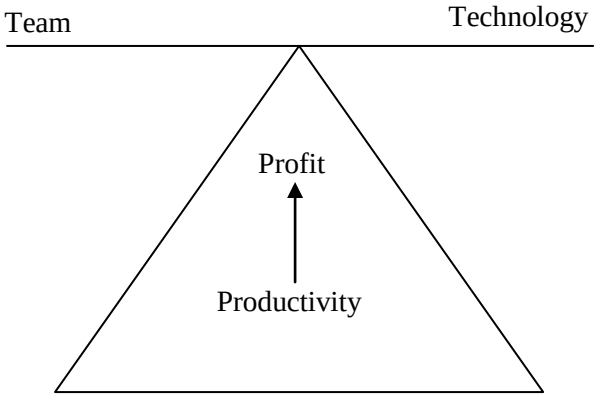
Besides the PMI's methodology, there are also other methodologies developed for different industries or different projects that describe various practices that should be followed in order to bring projects to completion. The **Pr**oject **in C**ontrolled **E**nvironment (hereinafter: PRINCE2) methodology, for example, is widely used by the UK Government as well as by the private sector in UK and internationally. It is briefly explained in the next section.

When talking about SMEs, Turner, Ledwith and Kelly (2010, p. 755) discovered that project management is used mostly for innovation and growth projects, and less for operations management such as product delivery. They have also found out that medium-sized companies need "lite", which is a simplified and less bureaucratic procedure of project management, and that they use more specialist and autocratic approaches to management. Micro and small-sized companies appear to need a micro-lite version of project management to support the work of generalists who work in small teams, and to support practicing of the laissez-fair style.

2.3 IT Project Management

IT project management deals with the management of implementing a new technology, while at the same time involves techniques for leading and motivating project team members. Its goal is not the technology itself, but achievement of certain business goals such as improved customer service or increased profitability, as presented in Figure 4 (Phillips, 2004, p. 3).

Figure 4: A project Manager Must Balance the Team and the Technology



Source: J. Phillips, *IT Project Management: On Track from Start to Finish*, 2004, p. 3.

Marchewka (2002, p. 24) contends that IT project management employs project management principles and tools that should be part of a methodology, which consists of step-by-step activities, processes, tools, controls and deliverables defined for the entire project. Thus, IT projects failures are avoided.

As Phillips (2004, p. 13) indicates, IT project management as a discipline becomes even more wearisome in today's business environment: constant IT changes are taking place; stakeholders and management have expectations that have to be met instantaneously; and ad-hoc temporary teams are created constantly to complete different projects.

The IT area is very wide, therefore different types of IT projects may be undertaken within it. Cadle and Yeates (2008, p. 3) have grouped them into nine broad categories:

- Software development
- Package implementation
- System enhancement
- Consultancy and business analysis assignments
- Systems migration
- Infrastructure implementation
- Outsourcing (and in-sourcing)
- Disaster recovery
- Smaller IS project

The ERP projects would fall under the Package implementation type, since, as the authors say, these projects involve the buying, installing, switching on and using of the package, which are the general activities practiced by companies when they buy off-the-shelf ERP solutions.

PMBOK is the most widely used guide and practice among IT project management professionals and the knowledge areas and process groups defined in PMBOK are important components used to describe activities in IT projects (Hewagamage & Hewagamage, 2011, p. 96). That is why these practices are also considered in this study, particularly the process group of planning the project.

Another methodology worth mentioning is the PRINCE2 methodology that represents a structured method for effective project management that offers non-proprietorial guidance based on best-practices in project management (JISC InfoNet, 2012). It involves the division of a project into manageable stages to enable efficient control of resources and regular progress monitoring. Project planning within this methodology is product-based, i.e. the project plans are much more focused on delivering results than on simply describing when certain project activities should be executed. According to Cadle and Yeates (2008, p. 51), this methodology offers a number of features that are of benefit for the management of IT projects, such as:

- A defined management structure
- A system of plans
- A set of control procedures
- A focus on product-based, i.e. deliverables-based planning.

2.4 Project Life Cycle

Projects follow several logical phases and even though there is no consensus on how to define these phases, many authors refer to the following as generic phases of the project life cycle: defining the project, planning the project, implementing the project and completing the project (Haynes, 2002, p. 4). Hewagamage and Hewagamage (2011, p. 98) agree that all projects, regardless of their size and complexity, can be mapped to these four phases of the generic project life cycle; if something cannot be mapped to these phases, the undertaking may not be considered as a project. Some authors such as Haughey (2012) also add monitoring and controlling as a separate project phase. PMI (2000, pp. 11-13) acknowledges these differences by indicating that many life cycles have similar phase names and four to five phases, but few are identical. Therefore they say that the project should be divided into phases but their number will vary based on the scope and the domain of the project. According to PMI (2000) each phase is marked by completion of one or more deliverables which are tangible work products and represent inputs for the higher phases. In the PMBOK they use the generic phases' names when referring to the five types of project management processes: initiating processes, planning processes, executing processes, controlling processes and closing processes. Figure 5 demonstrates the generic life cycle as well as the activity level present at each phase.

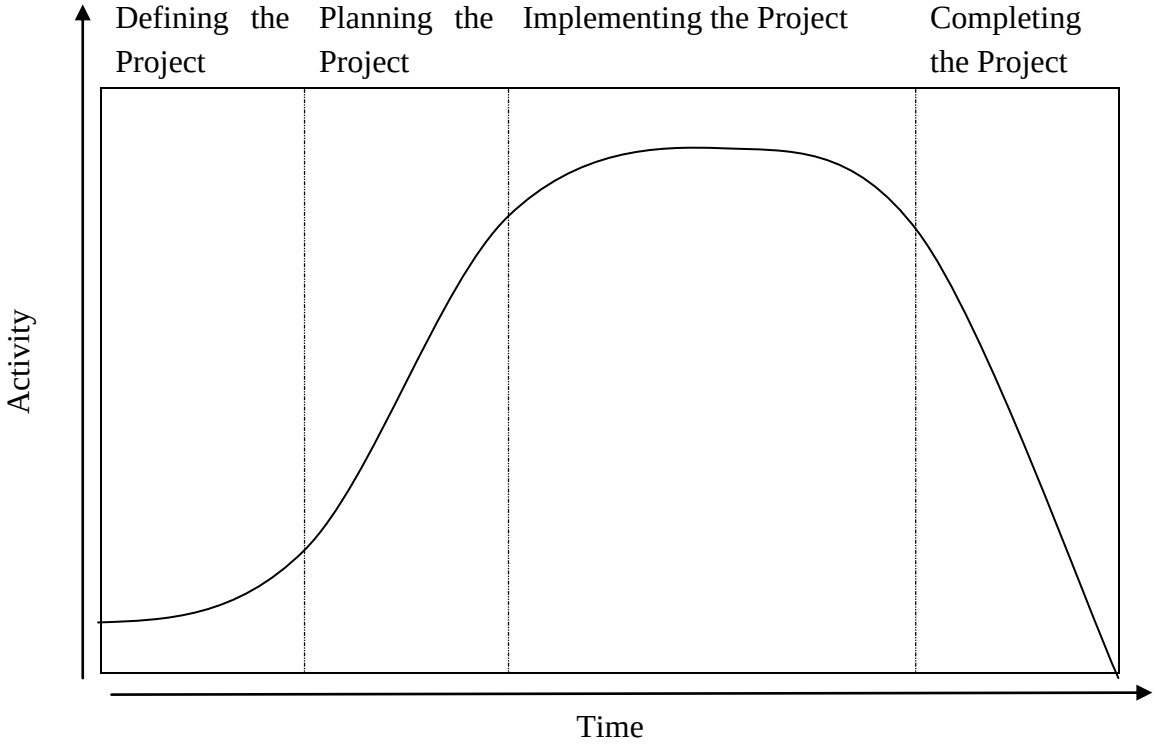
During the phase of project definition, the overall goal of the project is defined to give the project team a clear focus and to drive the other phases of the project (Marchewka, 2002, p. 12). A project manager is also assigned who, together with the project sponsor, will identify the necessary resources and team members needed to develop the key project parameters: cost, scope, schedule and quality. Their responsibilities are documented in the project charter that builds on the project proposal and includes the initial business case (Pataki, Dillon & McCormack, 2003, p. 3). According to Kerzner (2009, p. 68), the most important step in this phase is to conduct a preliminary analysis of the risks and their impact on time, costs, performance requirements and company resources.

The second phase involves the planning of time, cost and resources in order to estimate the work needed and to cope with the risks effectively during the implementation phase. Some of the activities that project planning phase includes are the following: development of scope statements, schedule, budget, creating WBS etc. (Haughey, 2012). Details on this phase are presented in section 3.

During the implementation phase the project team executes the activities that have been defined in the project schedule and develops the product or the service that the project

intended to deliver. This is the phase where most of the resources are applied (Pataki et al., 2003, p. 4).

Figure 5: Typical Activity Levels During the Phases of a Project's Life



Source: M. E. Haynes, *Project Management: Practical Tools for Success*, 2004, p. 4.

The closing phase ensures that what has been planned and agreed by the project team and project sponsor at the beginning has been realized during the project execution. It is usually accompanied by a final project report and presentation of the results to the sponsor (Marchewka, 2002, p. 14).

3 IT PROJECT PLANNING

As the main focus of this paper is the project planning phase, this section is dedicated to identifying the main IT project planning practices suggested by the IT project planning literature. A brief description of the other project phases is provided in section 2.4.

Project planning determines in advance the work that needs to be done so that the project goal can be achieved successfully (Haugan, 2002, p. 3). It provides team members with directions to follow during the rest of the project life cycle and tools to exercise control. It makes the other activities in project management far more effective and satisfying (Retting & Simons, 1993, p. 49). According to Aladwani (2002, p. 223), IT project planning plays a major role in achieving success on IT projects. Al-Mashari, Al-Mudimigh and Zairi (2003, p. 357), Glenn (2008, p. 18) and Tchokogué, Bareil and Duguay (2005, p. 155) acknowledge this for ERP projects in particular. Shanks et al. (2003, p. 199) also emphasize the importance of starting an ERP project with planning before going on to the actual implementation.

Glenn (2008, p. 18) argues that project planning is one of the five common factors that can determine the success of an ERP implementation. Taking into consideration the high costs associated with ERP implementation and the cumbersome process of realization, the importance of the planning issues cannot be overemphasized (Chen, 2001, p. 384). Mabert et al. (2003, p. 238) in their research of the US manufacturing sector, have also discovered that companies emphasize the importance of planning an ERP implementation.

Project planning involves different practices as well as tools and techniques that are used to facilitate the implementation of such practices. Some of the most popular are the Gantt chart, project network diagram, and critical path analysis (Schwalbe, 2010, p. 12). Much attention to project planning is also given in the PMBOK developed by PMI. The following practices will be covered in this study: definition of project goals, scope, milestones and deliverables, activities, schedule and budget, planning for risk and change planning. Most of them are mentioned as essential project management practices by the SMEs that were surveyed by Turner et al. (2010, pp. 752-753) and are an integral part of the PMBOK.

3.1 Business Case

In order to make an informed decision about whether to approve a project or not, the management of a company should consider the organizational value that is about to be brought, costs, feasibility benefits and risks of several alternatives (Marchewka, 2002). Salomo, Weise and Gemunden (2007, p. 294) refer to these initial planning activities as part of "Business planning". The analyses of the aforementioned issues, together with the recommendation of one alternative that will bring the most value in terms of improved efficiency or effectiveness, are contained in a document called **business case**. It contains information confirming that there is a significant justification for pursuing a project (Melton, 2008, p. 41).

The IT business case outlines the benefits that an organization can reap by using IT to improve its processes and practices (Remenyi, 1999, p. 6). According to Gambles (2009, pp. 4-9), it helps mobilize the support from all relevant stakeholders and provides a baseline for project measurement by setting out a schedule of deliverables, benefits and costs. Having careful selection and justification of an ICT project might have an effect on the project profitability; this may consequently affect the satisfaction level of the sponsors, users or the project team, and may influence the actual implementation time and cost (Milis & Mercken, 2002, p. 107). Little (2011, p. 36) also indicates the development of a business case as one of the criteria for successful projects. Even though it is usually created during the initiation project phase, some authors such as Mabert et al. (2010) consider it as a project planning practice. The same approach is used in this study, too.

3.1.1 Project team

The initial team, including the project manager, should be defined early in the project (Schwalbe, 2010, p. 88). As Malhotra and Temponi (2010, p. 35) indicate, it is one of the critical decisions to which SMEs should pay attention when implementing ERP.

A team, as defined by Williams (2002, p. 33), is a group of people who have complementary skills, work independently and interdependently to achieve a common goal and are mutually held accountable for the success or failure. Having an effective project team was recognized as one of the CSFs for an ERP implementation as indicated in section 1.6. Therefore, companies should plan to include on their team people with the appropriate skills and knowledge that would be able to execute the project by meeting the triple constraints. Having team members with different backgrounds, i.e. having a cross-functional team, is a very important aspect on an ERP project, as stressed by Wen-Hsien, Hwang, Jui-Chu and Sin-Jin (2011, p. 24) and Nah et al. (2003, p. 12). The responsibility matrix is a simple tool used for assigning responsibilities to team members and showing who does what (Aitken & O'Conor, 2000, p. 53).

The project manager has a major role to play on the team. He/she is responsible for planning, tracking and controlling the project so it can meet the predefined goals (Burke, 1993, p. 17). He/she is also responsible for ensuring that each member understands his responsibilities, facilitating communication among them and verifying that deliverables have been completed (Rosen, 2004, p. 118). The project manager ensures that the resources, time and scope, i.e. the triple constraints of project management, are managed well, so the project can stay within the time schedule and the budget (Carroll, 2009).

Based on the arguments contained in the sections 3.1 and 3.1.1, the first hypothesis can be stated as follows: ***Hypothesis 1*: Development of a business case has a positive effect on the project success.**

3.2 Project Plan

"The traveler who plans the route before beginning a journey ultimately reaches the intended destination more quickly and more easily than the disorganized traveler who gets lost along the way. Similarly, the project manager who takes time to create a clear project plan will follow a more direct route toward project success" (Larson & Larson, 2004).

Although planning is important for each phase of the project life cycle, the second phase, i.e. project planning, requires the most planning activities. The output of this process is a document called a **project plan** that guides the management team through the implementation phase (Schwalbe, 2010 p. 151). It contains answers to questions previously cited in the introductory section, such as the why, what, when and how long of a project.

It is worth noting that the process itself is iterative since the plan may change as new information becomes available (PMI, 2000, p. 44). Therefore, a team that follows the changes and is responsible for the on-time implementation usually creates the best project plans (Schifalacqua, Costello, & Denman, 2009, p. 29).

The most common items of a project plan, as indicated by PMI (2000, p. 45), are covered in the sections that follow.

3.2.1 Scope planning

Project scope management is one of the knowledge areas as defined by PMI (2000, p. 50) that encompasses processes that ensure that clear project boundaries are defined. From the scope definition, it should be clear what is included in the project and what is not. One of the processes involved in scope management is scope planning: during this process a scope statement is developed which will serve as a reference point for future project decisions (PMI, 2000, p. 50).

A scope statement is a document that specifies the goals, all the products, services, requirements and deliverables that must be delivered by the end of the project (Heldman, 2011, p. 97). It increases the accuracy of the resource estimation and enables more effective scope change management, thus reducing the probability of a project failure caused by scoping issues (Iijima, 2008, p. 18). Dvir, Raz and Shenhar (2003, p. 95) also indicate that the amount of effort invested in defining the goals, functional requirements and specifications has a positive effect on the project success.

Some of the major components of this statement are as follows (Heldman, 2011, p. 98; Kanabar & Warburton, 2008, p. 46):

- Project description: an overview of the project should be provided here.
- Goals and objectives (please refer to section 3.2.1.1 for more details).
- Project deliverables and milestones (please refer to section 3.2.1.1 for more details).
- Project requirements: the needs of customers regarding the characteristics, features or capabilities that the system must possess should be stated (Young, 2006, p. 15).
- Assumptions: all the things that are assumed to be true or certain should be documented (Heldman, 2011, p. 94). For example, while planning an ERP installation, if it is assumed that the in-house IT administrator would be available to handle any difficulties with the software whenever needed, this assumption should be clearly stated in this section.
- Project exclusions: everything that the project will not deliver should be specified.
- Limits and constraints: all factors that will pose any limitations to the project team, such as the project budget, should be stated (PMI, 2000, p. 55).
- Roles and responsibilities: in this section, “who does what” on the project should be stated.

A problem that arises with the scope definition is that new requirements or deliverables tend to be added constantly, leading to a never-ending project. This is referred to as a **scope creep** and project managers should learn how to manage it, usually by learning when to say "no" or "yes" (Turk, 2010, pp. 54-55). Nevertheless, the scope management process is iterative and should be managed as such (Khan, 2006, p. 13).

3.2.1.1 Project goal definition

It is important at this stage to clarify the goals of the project since they will determine most of the decisions made later during the other project planning activities. Furthermore, as Marchewka (2002, p. 69) indicates, the project goals provide direct linkage between a particular project and the overall company mission, so that the project team can stay focused on planning and executing activities that are contributing to the company in general.

In order to develop well defined goals, many authors suggest that five characteristics should be taken into consideration (Haughey, 2012, p. 1; Hill & Jones, 2012, p. 105; Nelson & Economy, 2010, p. 17). They are summarized with the SMART acronym, meaning that goals should be:

- **S**pecific: goals should be clear and explicit so that anyone involved in the project can have an exact idea about what they stand for, i.e. what is to be achieved, when and how.
- **M**easurable: goals should provide standards against which the performance can be measured. This would also enable project managers to keep employees motivated since they will have a clear idea about how much has been achieved and how much is needed to bring the goals to completion.
- **A**chievable: although goals should be challenging for the employees, they should not be set too high since that may discourage them and make them give up. They should neither be set too low because employees may feel them as unimportant and may ignore them. Achievable may mean that the goals should be able to be achieved within the time, budget and other resources available.
- **R**elevant: only those goals that are important for a company and that contribute towards attainment of the organizational mission should be specified in the project plan. Efforts should not be extended on things that are of minor importance.
- **T**ime-bound: the time period within which the goals are to be attained should be specified so that employees can focus their efforts and try to achieve them in due time. It may also act as a motivator for them by suggesting a sense of urgency.

In many cases, the term objective is used instead of goals (Heldman, 2011, p. 84; Kanabar & Warburton, 2008, p. 47).

As Al-Mashari et al. (2003, p. 357), Ngai et al. (2008, p. 551) and Umble et al. (2003, p. 251) argue, clearly defined goals and deliverables (explained in the next section) are CSFs and failure to define them leads to unsuccessful projects.

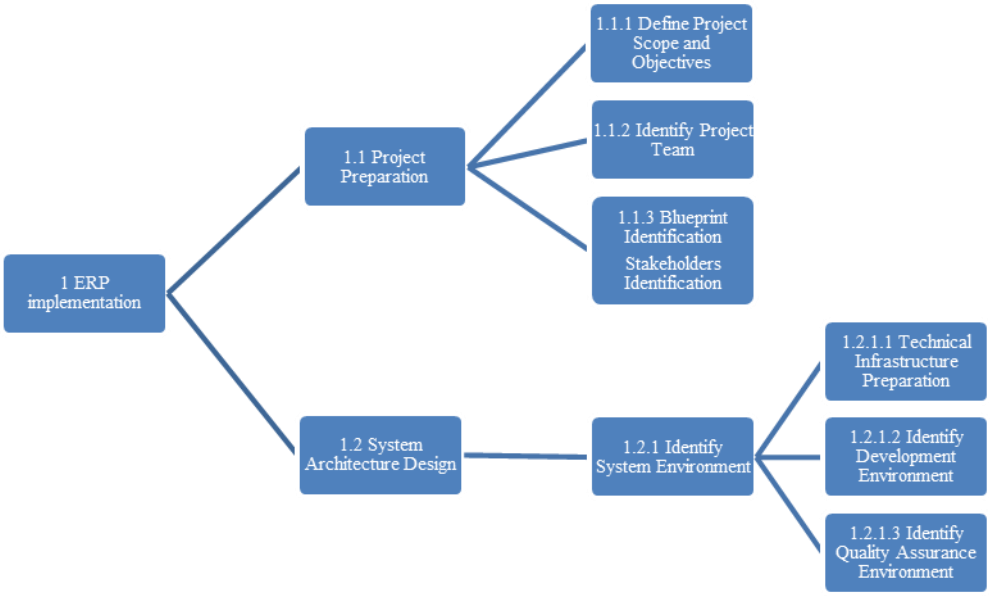
3.2.1.2 Milestones and deliverables

Milestones and deliverables are an integral part of the scope definition. Milestones represent significant events within the project life cycle and they have zero duration when compared to the project activities (Kanabar & Warburton, 2008, p. 48). Several activities need to be completed and a lot of effort needs to be spent in order to complete a milestone. They serve as markers and help the project team to easily track progress (Schwalbe, 2010, p. 215). Nah and Delgado (2006, p. 110) discovered that avoiding defining clear milestones can lead towards project delays and increased costs, thereby negatively influencing the success of the project.

Deliverables, on the other hand, represent tangible, measurable outcomes: products, services or capabilities that lead towards the completion of a project and the achievement of project goals. They are verifiable and mark the completion of a certain process, phase or the whole project. Usually they need to be approved by the customer or the project sponsor. There can be intermediate deliverables (e.g. system specification) and end or finished deliverables (e.g. software package) (Biafore & Stover, 2012; Greer, 2002; Kanabar & Warburton, 2008).

The WBS is an outcome of the scope definition process and represents "deliverable-oriented grouping of project components that organizes and defines the total scope of the project" (PMI, 2000, p. 59). It is usually presented as a hierarchical flowchart, whereby the top level usually represents the project goal and the lower levels represent increasingly more detailed descriptions of the deliverables. The lowest level deliverables within a WBS are called work packages (Burke, 1993, p. 86). A partial WBS for ERP implementation is presented in Figure 6.

Figure 6: A WBS for ERP Implementation



Source: A. Momoh, R. Roy & E. Shehab, *A Work Breakdown Structure for Implementing and Costing an ERP Project*, 2008, p. 96.

In order to develop a WBS, it is necessary to establish an appropriate naming and numbering system that will uniquely identify each item (Biafore & Stover, 2012). Similar to WBS, as Wysocki (2011, p. 75) indicates, a requirement breakdown structure (hereinafter: RBS) can be developed.

Given that the importance of scope definition has been confirmed by several authors mentioned in section 3.2.1 and its subsections, the second hypothesis can be stated as follows: ***Hypothesis 2*: Scope planning has a positive effect on the project success.**

3.2.2 Activity definition, sequence, resources and duration

During the process of activity definition, all activities that are needed to produce the deliverables are identified and documented in an activity list. The project goals play an important role once again, since they should be the result of the execution of the identified activities (PMI, 2000, p. 65).

The activity definitions are performed by decomposing or subdividing the lowest level deliverables, i.e. work packages, into more manageable components. These components are expressed in activity terms, describing the effort that must be spent over a certain period of time on a part of a project. The resulting list of activities should be designed as an extension of the WBS and should include an activities' description so that every team member understands how the work is going to be executed (Gido, 1985, p. 10; PMI, 2000, p. 67).

As soon as the activities are identified their sequence and interrelationship needs to be defined. Some of them may be performed linearly, or one after another, whereas some may be performed concurrently. The concurrent, or parallel activities, as Marchewka (2002, p. 70) argues, can help shorten the overall length of a project.

The sequence and the dependencies of the activities are usually presented with network diagrams that can be built manually or with the aid of software programs. Three methods can be used for development of these diagrams: *Precedence diagramming method* (PDM) (more on this method in Wysocki, 2011, p. 202), *Arrow diagramming Method* (ADM) (more on this method in Schwalbe, 2010, p. 215) and *Conditional diagramming method* (CDM) (more on this method in PMI, 2000, pp. 69-70).

The resource plan identifies the type and quantity of resources that are needed to complete each activity, such as people, facilities, equipment, money etc. (Biafore & Stover, 2012). As Marchewka (2002, p.70) indicates, each resource is associated with particular costs that can be calculated by using per-use charge or on a prorated basis.

3.2.3 Schedule and budget- the baseline plan

Marchewka (2002, p. 71) argues that as soon as the activities are being defined and their sequence, resources and duration are being estimated, they can be entered into project management software, such as Microsoft Project; this can easily determine the start and end

dates of a project, as well as the final cost. In this way a baseline plan is established to demonstrate how the project scope will be achieved within a schedule and budget (Gido & Clements, 2012, p. 162). The baseline plan is one of the main tools that help tracking project progress.

The project schedule describes the sequence and interdependencies of the project activities (Budd & Budd, 2010, p 136). It is established based on the calculations of a forward pass, i.e. by estimation of the earliest start and finish date of all activities; and backward pass, i.e. by estimation of the latest start and finish date of activities (Wysocki, 2012). One of the popular methods of schedule development is the **critical path method** (hereinafter: CPM). As defined by PMI (2000, p. 75), it "calculates single, deterministic early and late start and finish dates for each activity based on specified, sequential network logic and a single duration estimate". The critical path itself represents the sequence of activities that leads towards earliest project completion. It is actually the longest path within the network diagram that comprises activities that have least float, meaning that they can be least delayed without delaying their succeeding activities (Schwalbe, 2010, p. 228). The Gantt chart, a type of a bar chart, is a popular method of graphical presentation of the schedule that shows the activities' start and finish dates, their duration and dependencies (PMI, 2000, p. 78).

All of the aforementioned authors have indicated the development of a baseline plan as a necessary element of the project plan, thereby recognizing its importance for successful project implementation. Furthermore, Jha (2011, p. 207) recognizes the importance of effective project scheduling in particular by pointing out that it heavily influences the success of the project and that poor scheduling may easily lead to project delay and cost overruns. A study made by Verner, Evanco and Cerpa (2007, p. 188) reveals that 87% of the 153 projects they surveyed had developed a schedule for their projects. However, they did not find any significant relationship between the development of a schedule and projects success, which is contradictory to the claims made by previously cited authors. Since more authors argue for a positive relationship between the baseline plan and project success, the third hypothesis is defined as follows: ***Hypothesis 3*: Development of a baseline plan has a positive effect on the project success.**

3.2.4 Planning for risk

Since uncertainty is present on every project, risks are inevitable. They represent uncertain events or conditions that may influence the achievement of project objectives and thereby the project success in a positive or negative way (PMI, 2000, p. 127).

3.2.4.1 ERP risks

ERP projects, as complex undertakings that introduce companywide changes, have numerous risks associated with them. Iskanius (2009, p. 271), while reviewing literature on ERP risk management and conducting analysis on three SMEs, has identified three categories of risks:

- **ERP suppliers** (the risk that a company chooses an inappropriate supplier that does not understand its needs and wants or terminates the business and thereby their support).
- **ERP system** (the risk of technical malfunctioning and functional performance, i.e. how well the system can be configured, implemented and integrated).
- **Customer company** (risks related to the company's personnel and management, their skills, knowledge and experience, as well as the potential resistance to change).

Malhotra and Temponi (2010, p. 34) provide a different view by saying that the most common ERP risks for SMEs are the following: **1) small business location**, meaning that employees in small towns, due to a lack of contact with other similar professionals from different companies, are more inclined to resistance; **2) realities of small business**, meaning that SMEs, because of financial benefits, usually choose lower-cost ERP package at the expense of long-term benefits; and **3) company's niche and company management**, meaning that specialized processes of the company might not be taken into consideration by ERP vendors that develop standardized modules.

3.2.4.2 Managing ERP risks

Risk management is essential to help identify, evaluate, treat and monitor risks that may pose threats or opportunities to the companies on their way to achieving the project goals (Fekete, 2012, pp. 26-27). This author, while studying the Paks Nuclear Power Plant in South-Hungary, discovered that with proper risk management practices, the company can avoid losing as much as 5 million Euros.

The process of risk planning should start early in the project life cycle, as stated in section 3.1 and last until project closure. Table 3 shows the usual steps involved in this process, together with questions that managers should pose.

Table 3: Question for the Project Manager

Risk management process step	Management question
Establish the context	What are we trying to achieve?
Identify the risks	What might happen?
Analyze the risks	What that might mean for the project's key criteria?
Evaluate the risks	What are the most important things?
Treat the risks	What are we going to do about them?
Monitor and review	How do we keep them under control?
Communicate and consult	Who should be involved in the process?

Source: D. F. Cooper, S. Grey & G. Raymond, *Project Risk Management Guidelines: Managing Risk in Large Projects and Complex Procurements*, 2005, p. 15.

Some of the risk identification techniques suggested by Meredith and Mantel (2012) and Dallas (2008) are prompt-list, cause and effect diagrams, decision trees, and Monte Carlo

simulation. When identified, appropriate risk responses should be selected. Four options are available: avoidance, transference, mitigation and acceptance (PMI, 2000, pp. 142-143).

A study made by de Bakker, Boonstra and Wortmann (2012, p. 454) reveals that project stakeholders find risk management activities as positive contributors to the success of ERP implementation projects. Their study also demonstrates that companies do implement risk management practices when implementing ERP projects. Cooke and Davies (cited in de Bakker, Boonstra, & Wortmann, 2010, p. 501), in a study based on empirical evidence, discovered that risk management is positively related with the timely delivery of the project. Kwak and Stoddard (2004, p. 916) agree with the previous authors regarding the positive effect of risk planning and management on project success, but they point out that most project managers avoid these activities by considering them as extra work and expense.

Thereby the last hypothesis is stated as follows: ***Hypothesis 4*: Development of a risk plan has a positive effect on the project success.**

3.3 Planning for Change

As noted several times within this paper, ERP implementation introduces companywide change. However, changing the way in which the work is done in a company is never easy. Hence, the people side of change should always be considered in the overall implementation plan (Schifalacqua et al., 2009, p. 27) and the company should plan in advance how to deal with the resistance that the change may invoke. Malhotra and Temponi (2010, p. 34) suggest that first, the project manager should accept the resistance as such; he/she should than establish effective communication in order to clarify what the change is bringing, what are the benefits and what is expected from everybody in the company. Having developed good company vision and having related the change to this vision can be another beneficial change facilitator.

4 PROJECT SUCCESS

There are different points of view within the literature of how this concept should be operationalized, as indicated by de Bakker et al. (2010, p. 495) and Lee and Yu (2012, p. 88). Meeting the schedule, budget and requirements are the most cited measures for project success as pointed out by White and Fortune (2002, p. 6). De Bakker et al. (2010) refer to them as “traditional measures of success”. But according to Kerzner (2009, p. 7), in order for a project to be considered as successful, it should also be:

- Accepted by the customer/user
- With minimum or mutually agreed scope changes
- Without disturbing the main work flow of the organization
- Without changing the corporate culture.

White and Fortune (2002, p. 6) have discovered that project managers, in addition to the three most cited measures in the project management literature, use the following criteria for measuring success: the project must be in line with the organizational objectives, bring business and other benefits, cause minimal business disruption and meet quality/safety standards. Mahaney and Lederer (2006) in their study used a comprehensive scale that was previously tested by other authors to measure the project success. It consists of 12 items that measure three dimensions of project success**: client satisfaction**, **perceived quality of the project** and **success of the implementation process**. It actually encompasses what Kerzner (2009) and White and Fortune (2002) discovered in their studies. Therefore, these dimensions are also used in this study and are explained in more detail in section 5.3.2.

5 PROJECT PLANNING PRACTICES BASED ON ERP PROJECTS IN MACEDONIAN SMES

This section first gives a brief overview of the ERP and project management situation in Macedonia. It then discusses the research questions, hypothesis and results of the research that was conducted with SMEs in Macedonia that had implemented some ERP solution.

5.1 ERP in Macedonia

The presence of different software companies selling ERP software in Macedonia confirms that there is a market and interest for this type of software among Macedonian companies. Some of the companies that were identified during the research are the following: Datalab Makedonija (www.datalab.com.mk), GORD Systems (gord.com.mk), SRC (www.src.com.mk) and Sigma SB (www.sigmasb.com.mk). However, official statistics recording the number of Macedonian companies using ERP software were unfortunately not found, notwithstanding the research effort that was put into this issue.

Some of the reasons why Macedonian companies are introducing ERP, as indicated by Santa (2010) and several company representatives that implemented Pantheon ERP system (Datalab, 2012), are the following:

- Digitalization of all business information into a single database to enable easy generation of different reports
- Meeting the legislation requirements for accounting and finance, as well as the standards set by ISO and HACCP
- Easy tracking of products and inventories
- Integration of all business functions
- Facilitation of planning activities
- Introduction of control over the business in general

These reasons correspond with the ERP advantages that were identified during literature review as indicated in section 1.4.

Another characteristic of the ERP systems implemented in Macedonia is that they are smaller scale and adjusted to the needs of the SMEs who cannot afford to pay for powerful solutions such as SAP or Oracle. As deducted from the interviews conducted later in the research phase, usually just a few modules are implemented: finance, accounting and inventory (input, output) are the most common. They are usually implemented by the companies themselves without following any formal methodology and with little help from the vendors.

5.2 IT Project Management in Macedonia

As it was revealed in the literature (see section 2.3), IT project management has a very important role to play on any IT project, including the ERP projects. However, Ivanovska (2011) points to the fact that this discipline is not well-known or practiced in Macedonia. She believes that the main reason for this is the lack of human recourses with appropriate project management skills and knowledge; and she identifies the need for relevant seminars, conferences and lectures that will help young people in particular understand the importance of project management.

Santa (2010), in his study conducted in a small Macedonian company, has also found out that the ERP implementation was run intuitively based on the business experience of the owner, without employment of any particular project management practices. However, Ordanoski (2010), a Macedonian programmer and entrepreneur, has realized the importance of having developed a project and having assigned a team to work on an ERP implementation and has recommended these practices to other Macedonian managers.

I expect that this study will clarify whether Macedonian SMEs implement project management practices, specifically planning practices, and whether they influence the success of the ERP projects.

5.3 Research on Planning Practices Based on ERP Projects in Macedonian SMEs

5.3.1 Research questions and objectives

The particular objectives of this study are:

1. **To identify the main IT project planning practices through reviewing the IT project planning literature;**
2. **To determine the extent to which these practices are applied by the Macedonian SMEs when they implement ERP systems** (to draw conclusion on the way Macedonian companies plan ERP projects); and
3. **To determine how successful the ERP implementations in Macedonian SMEs are by using an empirically tested scale for measuring project success identified in the literature.**

This will enable me to test my initial assumption that *successful ERP implementation depends on implementing sound project planning practices, as suggested by the literature*. Therefore the primary research question is **whether IT project planning has an impact on the project success**. In order to discover this, answer to the following particular research questions should be provided:

- **What is ERP in general and which are the main CSFs for its implementation?**
- **Which are the planning practices that should be implemented on an ERP project?**
- **Whether or not Macedonian SMEs employ the identified planning practices on their ERP projects.**
- **What is the level of success of the ERP implementations in Macedonian SMEs?**

The answers to the first two questions are provided in the literature review that preceded this section. The other two are answered through an empirical survey that was conducted in Macedonian SMEs (details follow in the next sections).

Based on the answers of the first two questions collected through the literature review, the research hypotheses of this study are stated as follows:

- **Hypothesis 1**: Business case development is positively related to project success in terms of client satisfaction, perceived quality and implementation process.
- **Hypothesis 2**: Scope planning is positively related to project success in terms of client satisfaction, perceived quality and implementation process.
- **Hypothesis 3**: Baseline plan development is positively related to project success in terms of client satisfaction, perceived quality and implementation process.
- **Hypothesis 4**: Risk plan development is positively related to project success in terms of client satisfaction, perceived quality and implementation process.

5.3.2 Methodology

Two instruments are used for collecting primary data: a standardized questionnaire and in-depth interviews.

Before constructing a questionnaire, in-depth interviews were conducted with the owners of three small companies. The purpose of these interviews was to gain an overview of the way companies are approaching an ERP implementation and the goals they are pursuing when doing this. Furthermore, I tried to find out what they think about project planning in general and how they assess the success of their ERP implementation. During the interviews I also tried to discuss my initial questions for the questionnaire that I had developed during the process of the literature review.

The interviews were also beneficial for clarifying the terminology that managers were using when talking about ERP and planning in general. This was essential for appropriately formulating the survey questions. Three open-ended questions were asked initially, but

during the discussion several others were added to help me reach the research objectives. The questions are stated below:

- **How did you decide to implement an ERP system in general?** With this question I tried to understand the goals that the companies strived to achieve with the introduction of an ERP and the value they expected to gain.
- **What planning practices did you undertake before the actual implementation?** Hereby I tried to find out what planning practices were conducted before the implementation process.
- **How were you satisfied with the ERP system after it was implemented?** With this question I tried to understand the success of the ERP implementation as perceived by the companies' representatives.

Firstly, I discovered that companies' representatives do not use the term ERP to refer to the ERP software solution they have, but instead they used the term "Software" or "Computer program". When asked to clarify the functionalities of their software, it was clear that they had an ERP solution. Only one of the representatives used the term ERP as he had been presented with it by his vendor. Hence, I was advised to add clarification to the term ERP in the questionnaire by saying that it refers to the software used for internal materials management or software for managing internal operations.

From the first question, I discovered that companies had clear goals when they were implementing ERP, as it was suggested by the literature. Usually they wanted to integrate all the data so that reporting could be facilitated. Another important reason was that they had to introduce some software for accounting and finance, since it was required by the legislation rules.

Concerning the second question, I could have concluded that companies did use planning practices, but did not recognize them as such; i.e. they did not consider planning as a separate phase of the ERP project undertaking. Furthermore, I discovered that they did not use any particular tools, such as the Gantt chart, WBS or SMART objectives and were not even familiar with these terms. For example, one of the interviewees said that their finance manager was responsible for analyzing the costs of several offers, and their part-time IT technician for analyzing the features of the solutions; but no responsibility matrix was developed, nor was a Gantt chart used that would demonstrate these activities, their interdependencies or durations. The fact that the companies' representatives did not have a project management background was probably the main reason for such an approach. Munns and Bjeirmi (cited in Yanwen, 2012, p. 1548) recognize the lack of top management awareness about project management as one of the problems in developing countries. Furthermore, formal methodology of implementation was not mentioned by companies' representatives, except that vendors helped them install the system at the very beginning and provided them with brief instructions for use.

Besner and Hobbs (2008, p. 18) identify the difference between general project management processes and specific tools and techniques. The tools and techniques such as WBS or project charter are used by practitioners for executing particular project management processes. Therefore I decided that the best approach for the questionnaire would be to ask questions about general project planning practices and avoid going into details about specific tools used for their implementation as Besner and Hobbs (2008) did.

Asked about the third question, two of the company representatives considered their ERP implementation as successful. One of them was satisfied with the opportunities the ERP brought to them, but was not satisfied with the implementation process itself, since it took too long for the software to be implemented and accepted by all the users.

When discussing the initial questionnaire items, I discovered that I should avoid using specific project planning terminology (such as business case, deliverables, milestones) as they were not familiar to the companies' representatives. I also realized that I should avoid using the term "project" since company representatives were usually using "implementation" or "software" to refer to this project undertaking. I was also advised on one particular questionnaire item concerning the ERP implementation team: all of the interviewees advised on adding "responsible person for implementation" as an alternative to a "team", since none of them had a team for implementation but only one or two persons responsible for the implementation. This finding was also mentioned by Santa (2010).

A questionnaire helps in gathering standardized data from a larger number of respondents and it allows asking questions about attitude, opinion and organizational practices (Saunders, Lewis, & Thornhill, 2003). The questionnaire used in this study is divided into six sections (see Appendix A). The first section is dedicated to general type questions. The second one collects information about the level of implementation of the first IT project planning practice, i.e. development of a business case. The third one contains items measuring the level of implementation of scope planning practices. The fourth section collects information about baseline plan practices, whereas the fifth for risk planning practices. The sixth section contains items measuring project success.

Factor analysis is applied in order to confirm the dimensions defining both project planning and project success and to design the scales to be used in further analysis. The independent effect of the project planning dimensions on the project success dimensions is then measured by simple correlation analysis using the Pearson coefficient. The effect of all project planning dimensions on each of the project success dimensions is analyzed by regression analysis. This analysis is used in order to better understand the relationship between project planning factors and project success factors as suggested by Dvir (2005).

A combination of convenience and snowball sampling approaches is used to select 30 SMEs from different industries. This particular non-probability sampling approach is chosen because of the lack of any comprehensive list that encompasses all Macedonian SMEs that have introduced ERP solutions. SMEs, including micro enterprises, according to the

Macedonian Company Law (MSE, 2012), are defined as enterprises having 10 (micro), 50 (small) and 250 (medium) employees. The initial companies are identified on the web-sites of the ERP vendors as it is a normal practice to publish the names of the companies that have implemented their software. Personal contacts with industry are used, too. When contacted, the companies are asked to name another similar company that they might know or to forward the questionnaire themselves.

The questionnaire is made anonymous, whereby no data about companies' names or any other information that can identify them is collected. I employ this approach because, from my undergraduate studying experience in Macedonia, I have realized that companies, especially small ones, do not want their names to be mentioned in any case. This notice of anonymity was included in the cover letter as well as in the questionnaire itself.

The questionnaire was distributed electronically and in person during July 2012. The electronic version was sent by email as a MS Word document, but it was also available on-line using www.surveymonkey.com service. The on-line questionnaire allowed making respondents answer all the questions and therefore avoid item non-response. Nine questionnaires were received electronically, whereas 21 were received in person.

5.3.2.1 Measurement scales

The project planning practices identified during the literature review are taken as independent variables to be tested. Twenty one variables, as shown in Table 4, are used to measure the planning effort that companies put in when implementing ERP. They are all organized along four dimensions: **business case development practices, scope planning practices, baseline plan development practices** and **risk planning practices.**

The first dimension, business case development, is measuring practices involved in the initial planning that result in the creation of a business case. Salomo et al. (2007, p. 294) used a scale of nine items to measure this dimension. The same items are also used in this study, except that two of them (Alternative market scenarios and Fit with core competences) are removed as they are not considered applicable to this case. The final list of items is presented in Table 4. Since no comprehensive planning scales were identified for the next two planning dimensions, original scales were developed following the recommendations of Saunders et al. (2003) and Hair, Black, Babin and Anderson (2010). The risk planning dimension is measured on three items used in the study of Salomo et al. (2007, p. 302).

Respondents are asked to say to what extent they agree or disagree with each statement that indicates usage of a certain planning practice (1- strongly disagree; 7- strongly agree). Hakkinen and Hilmoli (2008, p. 307) as well as Aladwani (2002, p. 220) utilized the seven-point Likert scale when they measured project planning items. Therefore, the same seven-point Likert scale is used in this case, too.

Table 4: Project Planning Measurement Dimensions and Their Items

Business case (BC)	*Scope planning (SP)*	*Baseline plan (BP)*	*Risk planning (RP)*
Overall, the analysis we conducted before deciding to implement the ERP was thorough and methodical **(BC1)**	We defined the goals that we wanted to achieve with the ERP implementation **(SP1)**	We defined all the activities needed to execute the ERP implementation **(BP1)**	We conducted analysis of risks and their consequences **(RP1)**
We identified the main value drivers of the ERP implementation **(BC2)**	We defined all the outcomes that should have been delivered during implementation **(SP2)**	We did not define the sequence of the activities **(BP2)**	We created detailed plans for uncertainty reduction **(RP2)**
We conducted systematic identification of alternative ERP solutions **(BC3)**	We did not define the most significant events that should have occurred during implementation **(SP3)**	We defined the duration of the activities **(BP3)**	We created detailed risk response plans **(RP3)**
We conducted systematic selection of preferred ERP solution **(BC4)**	We defined the requirements that the software should have fulfilled **(SP4)**	We did not define the resources needed for activities execution **(BP4)**	
We evaluated the fit between the ERP implementation and the corporate strategy **(BC5)**	We did not consider all the constraints we had to cope with during the implementation **(SP5)**	We established a detailed schedule for ERP implementation **(BP5)**	
Relevant departments participated in the planning process **(BC6)**		We established a detailed budget for ERP implementation **(BP6)**	
Team/responsible person was committed to project goals **(BC7)**			

Source: S. Salomo et al., *NPD Planning Activities and Innovation Performance: The Mediating Role of Process Management and the Moderating Effect of Product Innovativeness*, 2007, p. 302.

In order to judge whether companies implemented certain planning practices or not, variables are recoded and values are grouped into two groups: **not implemented** (encompassing answers from 1- completely disagree to 4- neutral) and **implemented** (encompassing answers from 5- partially agree to 7- completely agree). The "Recode into different variable" option in SPSS is used as suggested by Brace, Kemp and Snelgar (2003, p. 127). The same option is used for variables that are expressed in negative terms (e.g. SP3 and SP5) to reverse code

them so that high or low values indicate the same type of response on every item (Grace-Martin, 2012).

Project success as a dependent variable is operationalized by using a scale consisting of 12 items measuring three dimensions of project success (see Table 5). This scale was used and empirically tested by Mahaney and Lederer (2006, p. 44) in their study that specifically analyzed information systems projects. They have used it since it was previously tested and its reliability was reported by several authors in the Project Management Journal. The 12 items scale measures three dimensions of project success: client satisfaction, perceived quality and success of the implementation process. Each of these encompasses several items, as shown in Table 5. The items themselves are slightly rephrased to suit the needs of this study.

Table 5: Project Success Measurement Dimensions and Their Items

Client satisfaction (CS)	*Perceived quality (PQ)*	*Implementation process (IP)*
The ERP software that was implemented works **(CS1)**	The implemented ERP software was the best choice among the set of alternatives **(PQ1)**	The ERP implementation came within its original schedule **(IP1)**
The ERP software is used by its intended users **(CS2)**	Use of this ERP software directly led to improved or more effective decision making or performance for the users **(PQ2)**	The ERP implementation came within its original budget **(IP2)**
This ERP software directly benefited the intended users either through increasing efficiency or employee effectiveness **(CS3)**	This software has a positive impact on those who make use of it **(PQ3)**	I was satisfied with the process by which the ERP software was completed **(IP3)**
Important users, directly affected by the ERP software, make use of it **(CS4)**	The results of the implementation of this ERP software represent a definite improvement on the way the users perform these activities **(PQ4)**	
We are confident that non-technical start-up problems were minimal, because the ERP software was readily accepted by its intended users **(CS5)**		

Source: R. C. Mahaney and A. L. Lederer, *The Effect of Intrinsic and Extrinsic Rewards for Developers on Information Systems Project Success*, 2006, p. 52.

According to Mahaney and Lederer (2006, p. 43), the first dimension tries to measure the level of acceptance of the project with its intended benefits by the users. The second one

measures the effect of the project in terms of improved performance. The third one tries to find out whether the project was completed on time, within schedule and whether it meets its technical goals.

Respondents are asked to say to what extent they agree or disagree with each statement on a seven-point Likert scale (1- strongly disagree; 7- strongly agree). In order to discover whether the projects are successful or not, the variables are recoded and answers are grouped into two groups: **not successful** (encompassing answers from 1- completely disagree to 4- neutral) and **successful** (encompassing answers from 5- partially agree to 7- completely agree).

5.3.3 Results

The analysis involves 30 representatives from different types of companies in Macedonia. All of them answered the questionnaire completely, and therefore item non-response is not present. The "Not applicable" option is also treated as non-response. The analyses are performed in SPSS 19.

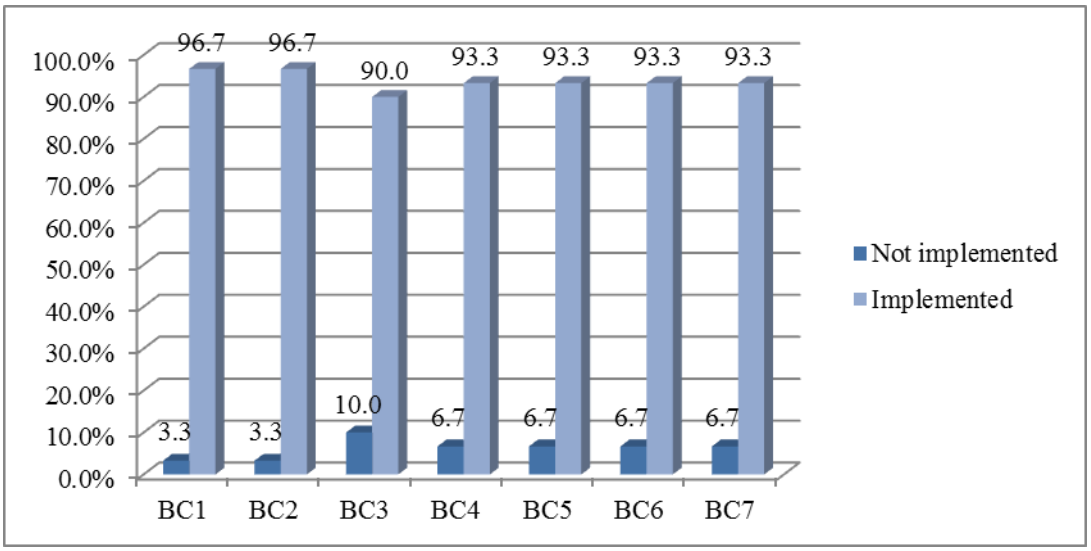
The first section of the questionnaire includs three general type questions used to identify the profile of the companies and their ERP implementations. The first question asks which industry the companies are operating in. The industry groups are identified as done by the official State Statistical Office of Macedonia (hereinafter: SSO) (SSO, 2012). Seventy percent of the respondents said that they operate in "transport, tourism, retail, wholesale and other services" industries (see Figure 1 in Appendix C). The second question, concerning the period of time companies have their ERP software, tries to identify how current the undertaking is. Respondents were given five options to choose from (Up to 1 year, 2-3, 4-5, 6-7 and above 7). Hereby, 46.7% said that they have it for 2-3 years. The same percentage counts for the 4-5 option. Only 6.7% of respondents said that they have it for 6-7 years (see Figure 2 in Appendix C). The third question asks for the length of the implementation period. Respondents were given five options to choose from (Up to 2 months, 3-5, 6-8, 9-11 and above 11 months). 63.3% of the respondents said that their project implementation lasted for up to 2 months (see Figure 3 in Appendix C). 16.7% said that their implementation lasted for 3-5 months, whereas 13.3% said that it lasted for 6-8 months. Only 6.7% said that their implementation lasted for 9-11 months. None of the respondents said that the implementation took more than 11 months.

The next section contains Likert-type items measuring different aspects of project planning. Their recoded values are analyzed only, because of the objectives of the study. The descriptives of the original variables are provided in Table 1 in Appendix D.

Firstly, the frequencies of implementation of business case development practices are evaluated. As Figure 7 shows, all of them were implemented by more than 90% of the respondents. The least implemented practice is the BC3, i.e. respondents used it least to identify alternative ERP software, whereas the most practiced case is the BC1, i.e.

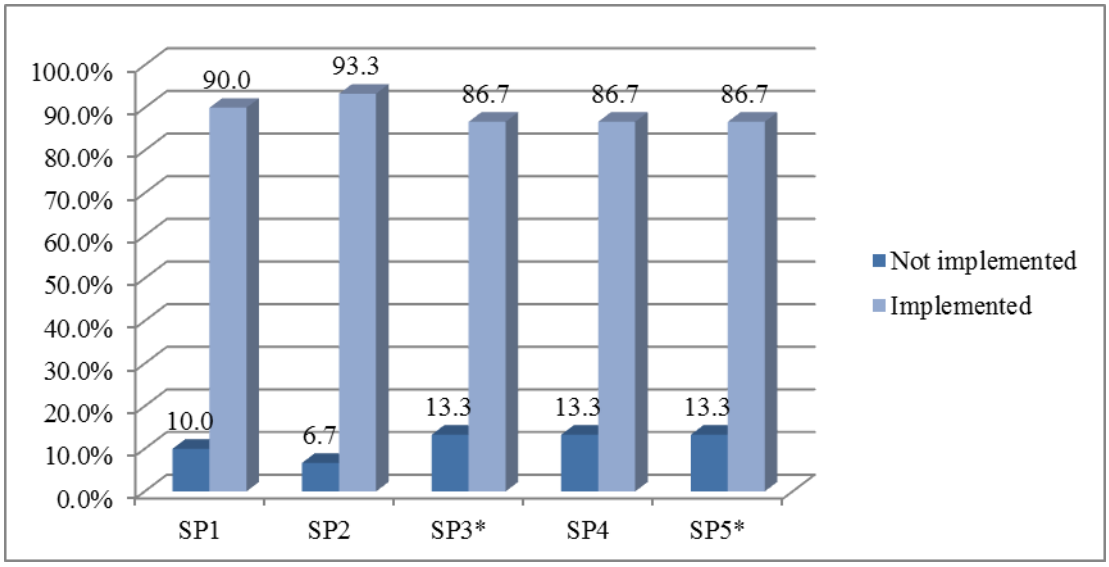
respondents in general used to conduct a thorough and methodical analysis before implementing ERP.

Figure 7: Frequency of Business Case Development Practices Implementation



Scope planning practices are also highly practiced, as Figure 8 demonstrates. The most widely practiced is the SP2, i.e. respondents defined all the outcomes to be delivered, before implementing ERP. SP1 is also highly practiced; this was expected since having defined goals was one of the most emphasized practices in the literature. The least implemented, with 86.7% of respondents saying that they use these practices, are SP3, SP4 and SP5.

Figure 8: Frequency of Scope Planning Practices Implementation

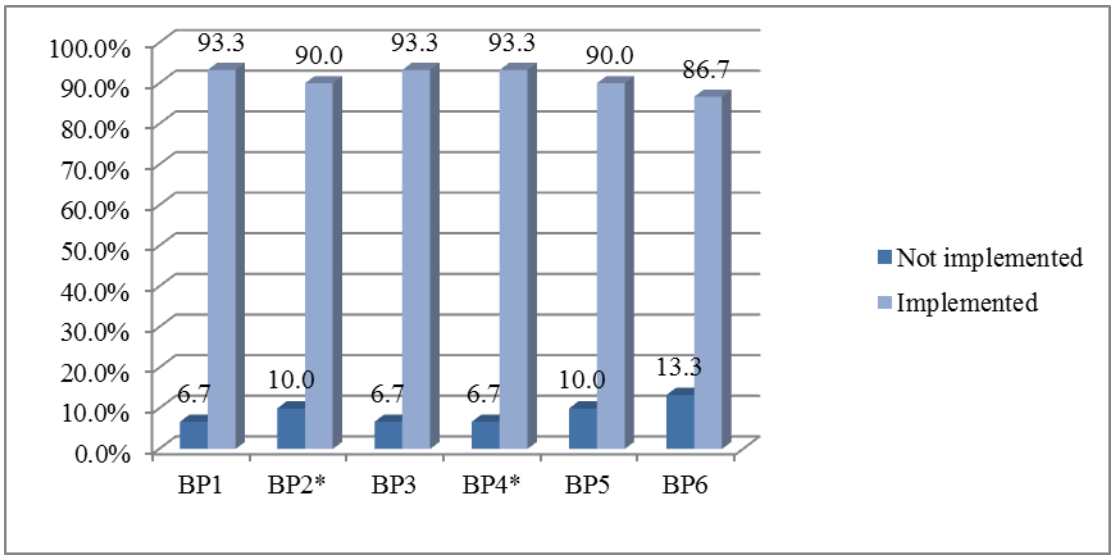


*Values of these variables were reverse coded

Regarding baseline plan practices, it can be concluded that, as the previous ones, they are implemented by most of the respondents (see Figure 9). However, the most practiced are BP1, BP3 and BP4 practices: 93.3% of the respondents said that they have implemented

them. The least practiced is the BP6 practice as 13.3% of respondents said that they had not established a detailed budget.

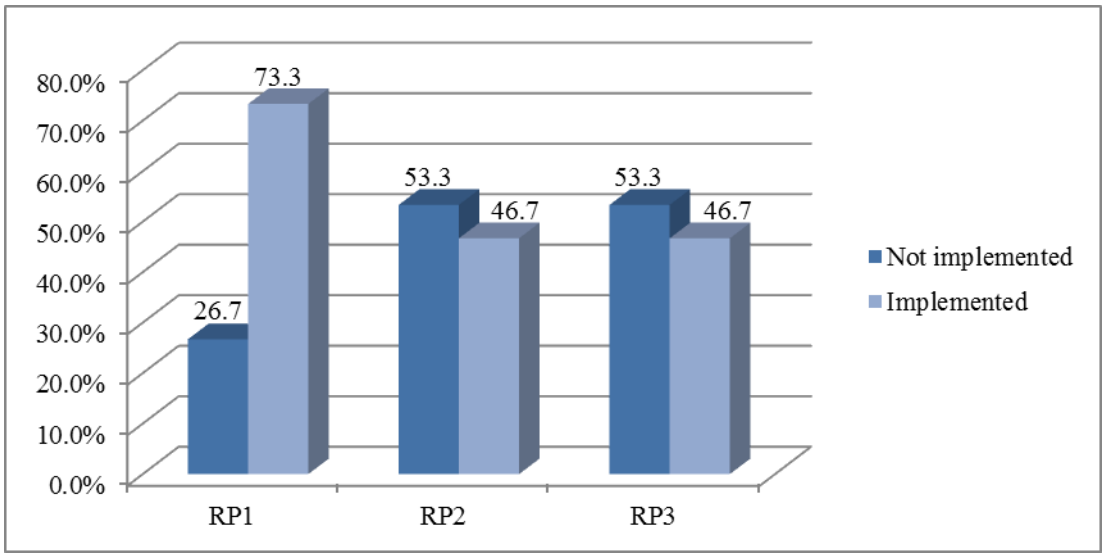
Figure 9: Frequency of Baseline Plan Practices Implementation



*Values of these variables were reverse coded

Risk planning practices, as Figure 10 shows, are least implemented by the respondents when compared to the previous three groups. The most widely implemented practice is RP1: 73.3% of the respondents said that they had analyzed the possible risks and their consequences. Nonetheless, 53.3% of them said that they did not develop any plans to reduce the uncertainty (RP2) nor they had developed a risk response plan (RP3).

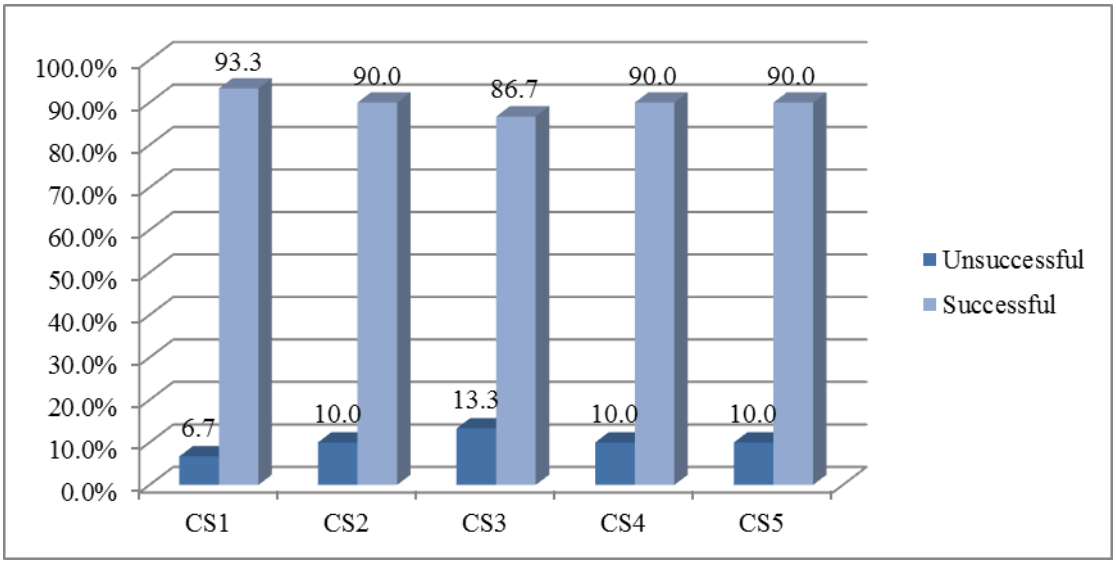
Figure 10: Frequency of Risk Planning Practices Implementation



The next section involves Likert-type items measuring different aspects of project success. Here, as in the case with planning variables, only recoded values are evaluated. Variables measuring client satisfaction are evaluated first as shown in Figure 11. Ninety percent of respondents or more assessed their projects as a success based on the CS1, CS2, CS4 and

CS5 variables. The projects were most unsuccessful on the CS3 variable, with 13.3% of respondents saying that the ERP software did not benefit the intended users through increasing efficiency or employee effectiveness.

Figure 11: Frequencies of Client Satisfaction Variables



Based on the information in Figure 12, it can be concluded that 90% of the respondents assessed their projects as successful on all four variables comprising the perceived quality dimension. Ten percent on the other hand said that their projects were unsuccessful based on these variables.

Figure 12: Frequencies of Perceived Quality Variables

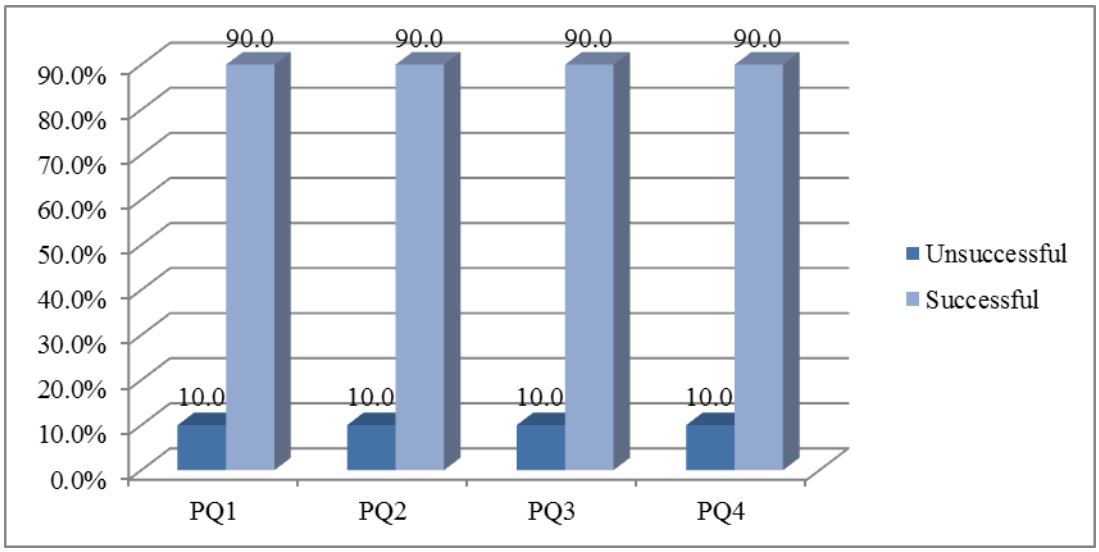
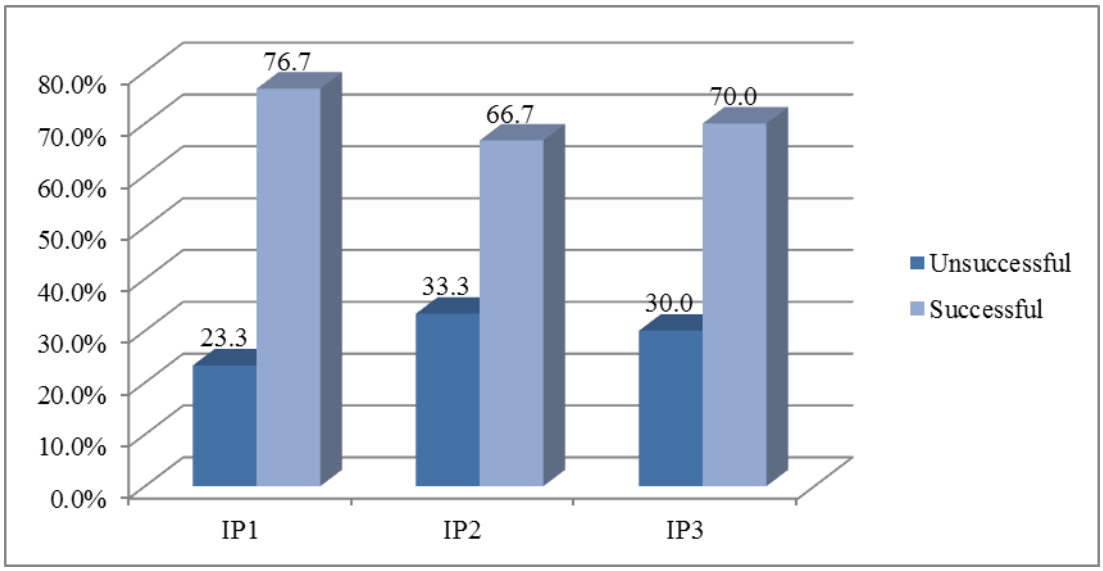


Figure 13 demonstrates that more respondents assessed their projects as unsuccessful on the implementation process variables than when they used the previous two groups of variables. It is worth noting that 33.3% of respondents said that their projects were not implemented within their original budget (IP2) and that 30% of them assessed the implementation process (IP3) as unsuccessful.

Figure 13: Frequencies of Implementation Process Variables



5.3.3.1 Confirmatory factor analysis

Factor analysis is performed in order to validate the grouping of the variables that was done during the questionnaire construction and to analyze their internal consistency as suggested by Dvir (2005). This enables reducing the large data to fewer, easy to interpret factors, on which basis summated scales are created to represent the dimensions or constructs measuring both project planning and project success.

Confirmatory factor analysis (hereinafter: CFA) is performed on the project success dimensions i.e. constructs since *a priori* pattern of factor loadings on each of the project success constructs was known from the theory (Hair et al., 2010). CFA helps to assess how well the theoretical specification of factors, i.e. measurement theory (Hair et al., 2010), matches the empirical data. CFA is performed using Analysis of Moment Structures (hereinafter: AMOS), the add-on module for SPSS. A measurement model showing how indicator variables come together to represent a latent construct, as well as how latent constructs relate to each other, are developed by using path diagrams in AMOS. A **latent construct** or latent variable (e.g. business case) refers to a hypothesized and unobserved concept that can be measured by observable or measurable variables, usually called **indicators** (e.g. BC1 variable), which are gathered through a certain data collection method (Hair et al., 2010). I hypothesize that unidimensionality exists and all cross-loading is constrained to zero, as suggested by Hair et al. (2010), in order to avoid construct validity issues. Also, no covariance between error terms is hypothesized, so the model can be considered to be congeneric. The construct's identification is defined by comparing the number of unique variances/covariances terms with the number of parameters to be estimated (factor loading and error terms). The number of unique variances/covariances is estimated using formula (1), whereby p is the number of indicator variables.

$$\textit{Unique variances/covariances} = 1/2*[p*(p+1)] \quad (1)$$

Maximum likelihood estimation is used for performing this analysis. The dataset does not include any missing data, so no missing data remedies are needed. However, the sample size in this analysis may be a problem. The following issues are affected by the sample size: the stability of the parameter estimates (Schreiber, Stage, King, Nora, & Barlow, 2006, p. 326); the level of precision; the statistical power of the parameter estimates; and the reliability of indices of overall model fit (Brown, 2006, p. 412). The sample cannot be split into two in order to estimate the model twice and check its stability. Furthermore, the recommendation of having 5 to 10 cases per estimated parameter (Schreiber et al., 2006; Brown 2006) is not met. According to Kline (cited in Harrington, 2008, p. 46), adverse effects may occur due to the small sample size, such as technical problems of non-convergence or improper solutions and low power. One of Kline's suggestions in this case is to use factor loadings greater than 0.6. Nevertheless, Marsh, Balla and McDonald (1988, p. 396) argue that χ^2, as one of the most cited indicators of goodness-of-fit, does not vary with the sample size if the model is true. The same applies to the Goodness-of-Fit index (hereinafter: GFI). However, having 30 cases in this case study was the most viable solution, given the time and resource constraints.

Measurement model validity is confirmed by evaluating the level of goodness-of-fit (hereinafter: GOF) and construct validity measures. According to Hair et al. (2010), GOF indicates how well the theory, i.e. the expected covariance matrix, fits the reality, i.e. the observed covariance matrix. The smaller this difference is, the better the model fits. Hair et al. (2010) identify three groups of GOF measures: absolute measures, incremental measures and parsimony fit measures.

The key GOF absolute measure is the Chi-square statistic and it is the only measure that is statistically based (Hair et al., 2010). It demonstrates the difference between the expected and observed covariance matrices. The closer to zero, the smaller the difference is between these two (Suhr, 2006, p. 1). Therefore, the null hypothesis is that these two covariance matrices are equal. A large ρ-value, i.e. statistically not significant, is needed in order to accept this hypothesis. Hair et al. (2010) recommend also using GOF measures of other groups in order to demonstrate adequate evidence of model fit. Hence, in addition to this statistic, five more GOF measures reported in the study of Mahaney and Lederer (2006, p. 53) are used in this case. The indexes, along with their cut-off points and the group they belong to, are presented in Table 6.

Construct validity indicates the degree to which observed variables measure the latent constructs that they are designed to measure. Hence, it demonstrates the accuracy of the measurement (Hair et al., 2010). Two components of construct validity are evaluated as in the study of Mahaney and Lederer (2006): convergent validity and discriminant validity. Regarding convergent validity, factor loadings, i.e. regression coefficients or path coefficients, as referred by Schreiber et al. (2006, p. 327), are firstly examined. They should all be statistically significant, and standardized factor loadings should be .5 or higher, or ideally .7 or higher (Hair et al., 2010). Squared multiple correlations or communalities show how much of the indicator variable's variance is explained by the model. They are calculated

as the square of the standardized factor loadings and it is best if they are .5 or higher (requiring factor loading of at least .7), meaning that the model explains at least 50% of the variation in a certain variable. The average variance extracted (hereinafter: AVE) representing the mean variance extracted for variables loading on a construct is also evaluated. It is best to be .5 or higher to confirm adequate convergence (Hair et al., 2010).

Table 6: Cutoff Criteria for Several Fit Indexes

Indexes	Shorthand	Group	General rule for acceptable fit if data are continuous
Chi-square	χ^2	Absolute	Ratio of χ^2 to $df \leq 2$ or 3
Comparative fit Index	CFI	Incremental	≥ .95 for acceptance
Normed Fit Index	NFI	Incremental	≥ .95 for acceptance
Root Mean Residual	RMR	Absolute	Smaller the better, 0 indicates perfect fit
Root Mean Square Error of Approximation	RMSEA	Absolute	< .06 to .08 with confidence interval
Adjusted Goodness-of-Fit index	AGFI	Parsimony	≥ .95

Source: J. F. Hair et al., *Multivariate Data Analysis*, 2010, pp. 641-646; J. B. Schreiber et al., Reporting *Structural Equation Modeling and Confirmatory Factor Analysis Results: A Review*, 2006, p. 330.

Since AMOS does not provide its calculation directly, it is calculated manually by dividing the sum of variables' communalities for each construct with the number of variables loading on that construct (Paswan, 2009). Construct reliability of .7 or higher is also sought as another proof of convergent validity. It demonstrates that the observed variables consistently measure the same construct (Hair et al., 2010). It is also calculated manually by using the sum of standardized loadings, squared, for each construct, and the sum of error variance terms for a construct or delta. Delta is calculated as one minus the variable communality (Paswan, 2009). Discriminant validity, on the other hand, measures the degree to which a certain construct is truly different from other constructs (Hair et al., 2010). It is established by comparing the AVE values of any two constructs with the square of the correlation estimate of those constructs (Hair et al., 2010). The AVE should be greater than the square of the correlation estimate. Furthermore, standardized residuals and modification indices are evaluated, as they may suggest some modifications for improving the model. Standardized residuals above |4.0|, according to Hair et al. (2010), indicate problems. They also argue that modification indices of 4.0 and higher suggest that if the constrained path is freed to be estimated, the fit will be improved.

Project success is defined by the three latent constructs presented in sections 5.3.2.1. The overall model is over-identified by having 78 unique variances/covariances terms-1/2[12*(12+1)], 27 parameters to be estimated (12 factor loadings, 12 error variances and 3 covariances), and consequently, 51 degrees of freedom. All constructs in CFA are exogenous and therefore only the covariance relationships are hypothesized among the three latent constructs (Brown, 2006; Hair et al., 2010; Schreiber et al., 2006).

The χ^2 value of 54.378 and ρ-value of .347 demonstrate good correspondence between the observed and expected covariance matrices. CFI with the value of .989 and RMSEA with the value of .048 and a 90% confidence interval between .000 and .131 also show a good model fit. However, NFI and AGFI are below the recommended level of .95. RMR, with the value of .086, does not indicate a very good model fit neither. However, the standardized residuals provided in Table 1 in Appendix E do not exceed the recommended level of |4.0|, suggesting no model changes. The modifications indexes provided in Table 2 in Appendix E do suggest some paths to be freed, but since they are not considerably higher than 4.0, changes are not made based solely on them, as suggested by Hair et al. (2010). Therefore, further analysis is made based on this initial model. The model demonstrates good convergent validity, as can be seen in Table 7.

All factor loadings appear statistically significant and all standardized factor loadings are above .5, as suggested by Kline (cited in Harrington, 2008, p. 46) and Schreiber et al. (2006, p. 327). All communalities are above the recommended level of .5. The AVE extracted by all three factors is above .5 and construct reliability measures are above .7, confirming the construct validity of the model.

In order to find out whether the model demonstrates discriminate validity, the correlation estimates among the factors are needed. They are given in Table 8. All of the squared correlations are lower than the AVEs, confirming discriminant validity of the model.

5.3.3.2 Exploratory factor analysis

Exploratory factor analysis (hereinafter: EFA), specifically Principal component analysis (hereinafter: PCA), is performed on all the variables measuring project planning constructs, since no *a priori* knowledge about the factors as they are used in this study existed. This technique enables discovering the latent dimensions that underline the data and helps to construct the scales that represent the planning practices in the regression analysis.

To justify the utilization of EFA, there should be strong correlation present among the variables. The visual inspection of the correlation matrix showed high Pearson coefficients (higher than .8) between many of the variables. Hair et al.'s (2010) suggestion is above .3 for these coefficients.

Table 7: Project Success Constructs Validity Measures

		Unstandardized factor loadings	ρ-value	Standardized factor loadings	Communality	Delta
Client satisfaction	CS1	1.000	.000	.801	.575	.425
	CS2	1.403	.000	.920	.849	.151
	CS3	1.308	.000	.806	.787	.213
	CS4	1.300	.000	.877	.851	.149
	CS5	1.373	.000	.920	.847	.153
	Σ			4.324	3.909	1.092
	AVE	**.782**				
	Construct reliability	**.945**				
Perceived quality	PQ1	1.000	.000	.924	.754	0.246
	PQ2	1.034	.000	.869	.853	0.147
	PQ3	.929	.000	.920	.847	0.153
	PQ4	1.061	.000	.922	.769	0.231
	Σ			3.635	3.223	.777
	AVE	**.806**				
	Construct reliability	**.944**				
Implementation process	IP1	1.000	.000	.887	.649	.351
	IP2	1.177	.000	.921	.847	.153
	IP3	.891	.000	.759	.641	.359
	Σ			2.567	2.137	.863
	AVE	**.712**				
	Construct reliability	**.884**				

Table 8: Correlation Between Project Success Constructs

	Estimate	Squared estimate
Client Satisfation (CS) ⇔ Perceived quality (PQ)	.456	.208
Perceived quality (PQ) ⇔ Implementation process (IP)	.223	.050
Client Satisfaction (CS) ⇔ Implementation process (IP)	.430	.185

The second indicator evaluated is the measure of sampling adequacy (hereinafter: MSA), which is an index with values of .5 considered as acceptable, both for individual variables as well as for the overall model (Hair et al., 2010). Individual MSAs in this case satisfy the criteria of being higher than .5, and the overall MSA with the value of .678 also satisfies the

criteria. The Bartlett test of sphericity with a Chi-square value of 515.927 is statistically significant with a ρ-value of .000 at .05 level of significance, providing evidence that the correlation matrix is statistically different from the identity matrix.

The analysis results in four factors extracted with eigenvalues higher than one. To better distribute the variance among them, Varimax rotation is used. Since two variables (SP2 and BP5) persistently cross-loaded even after the rotation, they were deleted one by another. The structure of the variables, after the deletion of the two variables, resembles the grouping of items done in the questionnaire. The factors account for 78.371% of the total variation in the variables, which is above the minimum of 60% (Hair et al., 2010). All variables have communality higher than |.5|, meaning that the solution explains more than 50% of their variation. Their factor loadings on the corresponding factors are also higher than |.5|, as it was sought in CFA, but very low on the other factors. This finding demonstrates the independence of the four factors (Dvir, 2004). The rotated component matrix and communalities are presented in Table 9.

Table 9: Rotated Component Matrix and Communalities

	Business case	Scope planning	Baseline plan	Risk plan	Communalities
BC1	**.783**	.185	.185	.220	.730
BC2	**.735**	-.187	.432	.104	.772
BC3	**.804**	-.033	.251	-.096	.720
BC4	**.865**	.139	.153	-.063	.795
BC5	**.825**	.131	.279	.137	.794
BC6	**.792**	.312	.092	.283	.814
BC7	**.533**	.344	.160	.400	.587
SP1	.156	**.937**	.148	-.038	.926
SP3	.215	**.806**	.242	-.238	.810
SP4	.051	**.876**	-.070	.099	.784
SP5	.043	**.809**	.244	.043	.719
BP1	.318	.221	**.854**	.174	.909
BP2	.210	.027	**.890**	.239	.894
BP3	.196	.166	**.886**	.174	.882
BP4	.284	.172	**.744**	.432	.850
BP6	.239	.152	**.782**	-.074	.697
RP1	-.033	-.134	.294	.880	**.880**
RP2	.038	-.068	.223	.879	**.828**
RP3	.366	.093	-.012	.738	**.687**

As CFA and EFA enabled confirming the structure of the employed factors, summated scales are created based on them before continuing with further analysis. They enable creating

single composite measures and thereby capture the multiple aspects of each factor represented by their indicator variables (Hair et al., 2010). Each scale value is the mean of the indicator variables (ESS Edu Net, 2012). The Cronbach's alpha for each scale, as a measure of internal consistency and reliability, is presented in Table 10. Values above .7 are sought as suggested by Hair et al. (2010).

High construct reliability measures estimated in CFA are consistent with the high Cronbach's alpha. This allows me to continue with the analysis by computing the correlation between the composite measures of project planning and the three measures of project success.

Table 10: Scales' Reliability

Scale	Cronbach's alpha
Business case (BC)	.915
Scope planning (SP)	.906
Baseline plan (BP)	.934
Risk planning (RP)	.836
Client satisfaction (CS)	.934
Perceived quality (PQ)	.948
Implementation process (IP)	.890

5.3.3.3 Correlation analysis

Correlation analysis is used to discover whether there is a relationship between two variables as well as to measure its degree and direction. The most common of these is the Pearson correlation that measures the degree and direction of the linear relationships between two variables. It is measured with the Pearson coefficient- r, which values range from 1.0 (perfect positive correlation when two variables vary in the same direction) to -1.0 (perfect negative correlation when two variables go in opposite directions) (Gravetter & Wallnau, 2010, p. 468).

As presented in Table 11, there are 21 correlation coefficients, six of them being statistically significant at .05 significance level and five at .01 significance level. All of them, except the one between scope planning and risk planning, are with positive signs demonstrating positive correlations between the variables. Firstly, there is moderate relationship (Walters, 2009, p. 162) between business case development and baseline plan ($r = .561$ and $\rho < .01$). Baseline plan is also statistically significantly correlated with risk planning, but there is a weak association between them ($r = .384$ and $\rho < .05$) (Walters, 2009, p. 162).

Regarding project success measures, client satisfaction appears significantly correlated with both perceived quality ($r = .440$ and $\rho < .05$) and implementation process ($r = .380$ and $\rho < .05$). But there is no statistically significant correlation between perceived quality and the implementation process; i.e. there is no sufficient evidence to claim that r is different from

zero. Hereby it should be noted that some of the correlations may appear statistically insignificant just because of the small sample size (Walters, 2009, p. 161).

Business case is moderately and significantly correlated with all of the project success measures: client satisfaction (r= .420 and ρ< .05), perceived quality (r= .507 and ρ< .01), and the implementation process (r= .476 and ρ< .01). Scope planning appears weakly, but statistically significantly correlated with client satisfaction (r= .370 and ρ< .05) only. Baseline plan is strongly correlated (Walters, 2009, p. 162) with client satisfaction (r= .708 and ρ< .01) and perceived quality (r= .621 and ρ< .01), and moderately correlated with the implementation process (r= .410 and ρ< .05). Risk planning is not significantly correlated to any of the project success measures.

Table 11: Correlations Between Project Planning Composite Measures and Project Success Composite Measures

		BC	SP	BP	RP	CS	PQ
SP	Pearson Correlation	.315	1				
	Sig. (2Tailed)	.090					
BP	Pearson Correlation	.561**	.326	1			
	Sig. (2Tailed)	.001	.079				
RP	Pearson Correlation	.342	-.008	.384*	1		
	Sig. (2Tailed)	.065	.966	.036			
CS	Pearson Correlation	.420*	.370*	.708**	.168	1	
	Sig. (2Tailed)	.021	.044	.000	.375		
PQ	Pearson Correlation	.507**	.342	.621**	.095	.440*	1
	Sig. (2Tailed)	.004	.064	.000	.616	.015	
IP	Pearson Correlation	.476**	.268	.410*	.202	.380*	.223
	Sig. (2Tailed)	.008	.152	.025	.284	.038	.236

** Correlation is significant at the .01 level (2-tailed)
* Correlation is significant at the .05 level (2-tailed)

5.3.3.4 Multiple regression analysis

Since correlation does not assume any causal relationships and measures only the individual relationships between two variables, not taking into consideration the effect of other variables, regression analysis is conducted next. Success measures are therefore indicated as dependent variables and planning measures as independent. Multiple regression is used since it allows measuring of the **relative** importance of each planning measure in predicting the project success measures (Hair et al., 2010).

Three regression equations are developed, each predicting one of the project success dimensions. The criteria of having five cases per independent variable included in the model (Hair et al., 2010) is satisfied in this case as one dependent and four independent measures are used each time.

I assume a linear relationship between the three dependent variables and the four independent variables as formula (2) demonstrates:

$$CS/PQ/IP = \beta_0 + \beta_1*BC + \beta_2*SP + \beta_3*BP + \beta_4*RP + \varepsilon \quad (2)$$

The hypothesis is that the models are not significant and that they do not explain the variation in the dependent variable better than the baseline model which is based on the mean:

H_0: $\beta_1 = \beta_2 = \beta_3 \ldots\ldots = 0$
H_1: *At least some of the β does not equal 0*

The model summary and ANOVA results from running a step-wise regression analysis for all three dependent variables are provided in Table 12. All three models appear valid, according to the ANOVA analysis ($\rho < .05$), demonstrating that they improved the prediction significantly when compared to the baseline model based on the mean (Hair et al., 2010). Therefore, the hypothesis that the models are not significant is rejected.

Table 12: Models' Summary and ANOVA

	Model Summary		ANOVA	
	R^2	Adjusted R^2	F	Sig.
CS	.501	.483	28.088	.000
PQ	.385	.363	17.532	.000
IP	.227	.199	8.214	.008

Based on the value of R^2, the first model explains 50.1% of the total variation in the client satisfaction. The second one explains 38.5%, whereas the third one has the least explanatory power (22.7%). The differences between R^2 and Adjusted R^2 are small, indicating that no redundant variables are present in the model and that there is no over fitting of the data. Trying different methods of entering or removing variables provided similar results.

Table 13 presents the coefficients derived by the three regression analysis. Only statistically significant unstandardized (B) and standardized (beta) coefficients are presented ($\rho < .05$).

Table 13: Regression Coefficients

		BC			SP			BP			RP		
	Intercept	**B**	**Beta**	**Sig**	**B**	**Beta**	**Sig**	**B**	**Beta**	**Sig**	**B**	**Beta**	**Sig**
CS	2.940							.583	.708	.000			
PQ	3.572							.475	.621	.000			
IP	.033	.856	.476	.008									

As Table 13 demonstrates, each success measure is predicted by only one planning dimension. Business plan development comes to be significant in predicting both client satisfaction and perceived quality success. Business case, according to the analysis, is a significant predictor of implementation process only. Scope planning and risk planning did not enter any of the regression models, indicating their statistically insignificant contribution in predicting the project success dimensions.

Based on the coefficients the actual variates are specified with formulas (3), (4) and (5) as follows:

$$CS = 2.940 + 0.583*BP \quad (3)$$

$$PQ = 3.572 + 0.475*BP \quad (4)$$

$$IP = 0.033 + 0.856*BC \quad (5)$$

Referring back to the hypothesized relationships, as Table 14 shows, two hypotheses are partially accepted, whereas the other two are rejected.

Table 14: Hypothesis Overview

Hypothesis 1	Business case development has a positive effect on the project success in terms of client satisfaction, perceived quality and implementation process.	√X
Hypothesis 2	Scope planning has a positive effect on the project success in terms of client satisfaction, perceived quality and implementation process.	X
Hypothesis 3	Baseline plan development has a positive effect on the project success in terms of client satisfaction, perceived quality and implementation process.	√X
Hypothesis 4	Risk plan development has a positive effect on the project success in terms of client satisfaction, perceived quality and implementation process.	X

Based on the regression analysis, the development of a business case is a significant predictor of implementation process only. The correlation analysis showed that it is also moderatly, but statistically significantly correlated to the client satisfaction and perceived quality. Therefore,

the first hypothesis is only partially accepted. Baseline plan development is a significant predictor of client satisfaction and perceived quality as hypothesized. The correlation analysis also confirms these positive relationships since baseline plan development is most strongly correlated with client satisfaction and perceived quality when compared to the other project planning variables. Even though the correlation analysis also shows statistically significant correlation with implementation process, its unique explanation power was not large enough to enable it to enter the model. This is most probably because of its significant correlation to business case. Therefore, the third hypothesis is also partially accepted. Regarding scope planning and risk planning, both correlation analysis and regression analysis indicate that these two are not related to any of the project success measures. Thus, the second and fourth hypotheses are completely rejected.

6 DISCUSSION, LIMITATIONS AND RECOMMENDATIONS

The literature unambiguously indicates that project planning has an important role to play in determining the success of the IT projects and ERP projects in particular. As Ngai et al. (2008, p.551) concluded, having a clearly defined project plan (goals, objectives, scope and schedule) was one of the most cited CSFs in the regions that they have studied. Mabert et al. (2003, p. 312) have also discovered that companies are stressing the importance of upfront planning for successful ERP implementation. The results from this study show that Macedonian companies that were included in the sample do implement project planning practices, as suggested by the literature. At least 85% of the respondents are implementing each of the practices involved in the development of a business case (see Figure 7), project scope (see Figure 8) and baseline plan (see Figure 9). However, the study shows that risk planning practices are least implemented when compared to the other project planning practices. Detailed plans for uncertainty reduction (RP2) and detailed risk response plans (RP3) were implemented by only 46.7% of the respondents. On the other hand, this finding is in line with the argument of Kwak and Stoddard (2004, p. 916), who point out that most project managers consider the risk management activities as extra work and expense, and therefore avoid implementing them. Analysis of risks and their consequences (RP1) was made by 73.3% of the respondents. It seems that companies involved in the case study do conduct analysis, but consider the actual development of plans as extra work and expense as argued by Kwak and Stoddard (2004, p. 916).

These findings are contradictory to the Macedonian study being conducted in the ERP field which argues that Macedonian companies do not follow project planning (Santa, 2010). However, as mentioned in section 5.3.2, the questionnaire was developed in such a way that it did not ask for any particular project planning tools and it did not include any particular project management terminology. Instead, I followed the findings from the interview phase, believing that it is better to ask, for example, whether companies have identified alternative ERP systems or whether they have identified the value of the ERP implementation, than to ask if they have developed a business case. Therefore, I suppose that questions in this case were clearer for the respondents and they were able to provide more realistic answers.

With regards to the project success evaluations, most of the respondents (at least 85%) assessed the projects as successful, based on client satisfaction and perceived quality dimensions (see Figures 11 and 12), whereas the last dimension, measuring whether the project was implemented on time and within budget, received more negative responses (see Figure 13). Most negative responses were given on the IP2 variable (33.3%), which measures whether the project was completed within budget. Based on these findings a conclusion can be made that the major issues that the companies faced during ERP implementation are related to budget overruns, and less frequently to schedule overruns. These findings are in relation to many of the author's arguments, one of them being Zhang et al. (2005, p. 57), who argue that companies very often experience budget and schedule overruns when implementing ERP.

Nevertheless, the results of this study provide only partial support to the main claim that planning has a positive effect on the project success: It was discovered that not all of the planning practices have an equal effect on the project success. Development of a baseline plan appears to have a major effect since the correlation analysis demonstrated that it is significantly correlated with all three success measures (with client satisfaction and perceived quality based on a significance level of .01, and with implementation process based on a significance level of .05) and the regression analysis confirmed the positive effect on two of them (client satisfaction and perceived quality). Development of a business case, according to the correlation analysis, is also significantly correlated with all of the project success measures (with perceived quality and implementation process based on a significance level of .01 and with client satisfaction based on a significance level of .05). However, it only entered the regression equation of implementation process success dimension, demonstrating that when taken into consideration with other planning variables, it only has an effect on the implementation process. Scope planning and risk planning, on the other hand, demonstrate no relationship with any of the project success measures. Both correlation analysis and regression analysis indicate that these two are not related to any of the project success measures.

Based on the correlation analysis, the development of a business case is positively related to all of the project success measures. Therefore, it can be expected that if more effort is made in developing a business case, the ERP implementation would be more successful in terms of client satisfaction, perceived quality and implementation process. However, when business case is strictly defined as a predictor variable of the project success measures, as in the regression analysis, it turns out that it only has a significant contribution to the implementation process success. Based on the regression coefficient, a conclusion can be made that, for every increase of one point in the attitude of respondents regarding business case development, the perceptions of the success of the implementation process will increase on an average of 0.856 points on a 7-point Likert scale. That is why the first hypothesis is only partially accepted. Based on this it can be concluded that the suggestion of Little (2011, p. 36), that development of a business case is a criteria for successful project, is partially supported. These results are also partially in line with the findings of Milis and Mercken

(2002, p. 107), since they argue that having careful selection and justification, which is the main purpose of the business case, has an impact on the implementation time and cost (confirmed by the regression analysis's results), as well as on the users satisfaction (not confirmed by the regression analysis's results).

The baseline plan is a significant predictor of client satisfaction and perceived quality, as hypothesized. By defining all the activities and their resources, it affects the ERP implementation in that it helps it to be implemented appropriately (client satisfaction) and brings the expected benefits (perceived quality).

As the sign of the coefficient of baseline plan demonstrates in the client satisfaction variate, for every increase of one point in the attitude of respondents regarding baseline plan development, the client satisfaction will increase on an average of 0.583 points on a 7-point Likert scale. Perceived quality, on the other hand, will increase on an average of 0.475 points. The correlation analysis also confirms these positive relationships since the baseline plan is most strongly correlated with client satisfaction and perceived quality when compared to the other project planning measures. Furthermore, it is also positively related to the implementation process, with r= .410 being significant at .05 significance level. However, the implementation process's regression model demonstrates that planning of schedule and budget does not lead towards a project being completed on time and within budget, as hypothesized; but that another variable, in this case business case development, is a better predictor. Therefore, the hypothesis that states that baseline plan development has a positive effect on the project success is also partially accepted.

The contradictory findings, based on the regression analysis, stating that baseline plan development does not affect implementation process might be explained in several ways. Firstly, companies under study may indeed consider achieving client satisfaction and reaping the benefits from the ERP to be more important than completing the implementation on time and within schedule. As a result, they might plan all the activities and their resources in order to achieve that. Unfortunately, this issue was not studied and may become an interesting topic for further studies. Secondly, due to the small sample size, the partial correlation of baseline plan might not have been considered statistically significant when compared to the business case development, and thus baseline plan has been removed from the model. On the other hand, this finding is partially in line with the findings of Verner et al. (2007, p. 188) who discovered that development of a schedule does not affect project success. However, I cannot completely rely on this finding because firstly, they only measured one aspect of a baseline plan, and secondly, they measured project success in general, without defining it in more detail.

Little (2011, p. 37) has indicated the definition of the project scope as one of the criteria for successful projects. Ngai et al. (2008, p. 551) and Umble et al. (2003, p. 251) emphasized that clear definitions of project goals (SP1) and deliverables (SP2) are project CSFs. Furthermore, Nah and Delgado (2006, p. 110) have found out that the defining of clear scope and milestones (scope planning) has a particular influence on the implementation time and budget

(implementation process). One of their companies under study did not follow this recommendation and therefore experienced higher costs and had to delay some critical tasks. However, the scope planning measure did not enter any of the regression equations demonstrating its weak unique effect on the project success measures. The correlation analysis, on the other hand, showed that scope planning is weakly but statistically significantly correlated only to client satisfaction project measure. As the analysis in this case does not provide support to any of the aforementioned statements, the second hypothesis claiming that the definition of project scope has a positive effect on the project success is rejected.

De Bakker et al. (2012, p. 454) found that project stakeholders find risk management activities as positive contributors to the success of an ERP implementation projects. Cooke and Davies (cited in de Bakker et al., 2010, p. 501) also determined that risk management is positively related to the timely delivery of the project in specific. However, the regression analyses in this study omitt risk planning in all three equations, demonstrating its insignificance in predicting the project success. Correlation analysis also confirms this statement since risk planning does not demonstrate positive correlation to any of the project success measures. Therefore the forth hypothesis is also rejected.

The contradiction of the results in the case of scope planning and risk planning might be explained by the limitations brought by the sample size. As Hair et al. (2010) argue, a smaller sample size can make even strong correlations appear statistically insignificant. Since the sample used in this study includes only 30 cases, it is reasonable to conclude that some insignificant results may occur because of this issue. The correlations coefficients' signs, on the other hand, do reveal that there is a positive association between scope planning and project success, as well as between risk planning and project success, as suggested by the literature. However, because of the statistical insignificance, there is not enough evidence to claim that these linear relationships definitely exist.

Based on the results of this study, the main recommendation would be that even though every project planning practice is important for the success of the project, as indicated by the literature, more effort should be put into the development of a business case and a baseline plan. These two measures appear to have a major effect on the ERP project success in the Macedonian companies that were included in the sample. I speculate that this is the case, as both encompass more tangible and measurable activities that are easier to understand when compared with scope planning and risk planning activities. For example, baseline plan expresses all the decisions that have been made during scope planning into clearly defined activities that have to be executed. This method might be better understood and followed by the implementation team or the person responsible for implementation, than when they are expressed in terms of goals or deliverables. This especially counts for companies that do not possess human resources with appropriate project management skills, as in this case study.

Finally, the study also reveals a statistically significant relationship between business case development and baseline plan and between baseline plan and risk planning. Although these

measures appear independent during EFA (as explained in section 5.3.3.2), the relationship between them is not unexpected. It is normal that companies, when planning the schedule and budget (baseline plan), take into considerations the possible risks (risk planning). Concerning project success measures, client satisfaction appears significantly correlated with both perceived quality and implementation process. Therefore, when a project is assessed high on client satisfaction, it can be expected that both perceived quality and implementation process success would be high as well. This is consistent with the finding of Downing (cited in Mahaney & Lederer, 2006, p. 48) who argues that projects that lead to more efficient decision making result in greater system usage.

The major limitation of this study relates to the small sample size. Thirty cases are not enough to satisfy the criteria of having five observations per variable and an absolute sample size of at least 50 in order to conduct EFA and CFA (Hair et al., 2010, p. 104). The sample size also affects the stability of the parameter estimates (Schreiber et al, 2006, p. 326) as well as the level of precision, statistical power of the parameter estimates and the reliability of indices of overall CFA model fit (Brown, 2006, p. 412), as argued in section 5.3.3.1. The same applies to the Pearson correlation coefficients that might appear insignificant just because of the small sample size.

I should hereby also emphasize that, because of the sample size issue, the results of this study are sample specific and cannot be generalized to the whole population, i.e. to all Macedonian companies that have implemented ERP (Dattalo, 2008, p. 12; Hair et al., 2010).

The method used for selecting observations may also have a negative effect on this study. Snowball method is used in this case, but it often leads to the selection of cases with very similar characteristics (Lee cited in Saunders et al, 2009, p. 240). Furthermore, because of time and resource constraints, the questionnaire was not pilot-tested, as suggested by Saunders et al. (2009, p. 394).

Further studies may overcome these issues by selecting a larger sample size and a different sampling approach. This might additionally enable the utilization of Sequential Equation Modeling that could examine the relationship between project planning and project success measures into one model, instead of developing several regression models. This was avoided in this case because the model that should have been estimated is quite complex and requires a much larger sample size (Hair et al., 2010, p. 638) than the one used this time. Furthermore, as the study validated an existing instrument for measuring project success and developed a new one for measuring project planning, they both might be used in further studies with more confidence. Finally, change management was identified as a very important determinant of ERP project implementations during the literature review, but this variable was not included in the actual analysis. I consider it as an interesting topic that can be studied in a separate study.

CONCLUSION

Contemporary business environment requires new forms of organization that will enable companies to have easy access to all information within the company in order to perform effectively and efficiently, make timely decisions and thereby gain a competitive advantage over the other players on the market. This would not be possible without the facilitating role of technology and specifically the emergence of the ERP systems. By implementing these systems, companies introduce best practices to their business processes and enable easy access to information. They therefore experience many benefits, some of them being cost reduction, quality improvements, decision making, planning improvements and business growth.

However, the introduction of such a system is not an easy task and many times poses difficulties to companies that try to implement it. Many CSFs have been identified, one of them being the careful application of IT project management practices and specifically project planning ones. By planning in advance the work that has to be executed, companies provide project team members with directions to follow and tools to exercise control and track progress. This has been recognized as having a signifiant effect on the ERP implementation success in terms of completing the implementation within schedule and budget, as well as satisfying the users and improving their performance. Since Macedonian SMEs follow the trend and implement ERP systems, it is expected that they will have to cope with the same implementation issues and implement similar practices in order to overcome them. That is why I conducted this study to discover whether Macedonian SMEs plan the ERP implementation in advance and whether such practices bring a positive contribution to the implementation success.

The results of the study demonstrate that Macedonian SMEs implement general project planning practices even though they do not consider the planning process as a separate phase of the ERP implementation. However, they do not use any particular project planning tools, such as the Gantt chart or WBS. This was assumed to be so because of the lack of project management skills within the companies that were surveyed. From the project planning practices that were surveyed, the most practiced are the ones involved in the development of a business case, project scope and baseline plan. The least practiced are the risk planning practices, which finding is consistent with the literature.

Considering the success of the ERP implementations, this study demonstrated that most of the companies' representatives perceive this undertaking as success in terms of client satisfaction and perceived quality measures. A higher percentage of respondents find their ERP implementations unsuccessful in terms of implementation process measures, when compared to the previous two success dimensions.

However, the study discovered that not all of the IT projects planning practices have the same effect on the project success. Development of a baseline plan appears positively related to all of the project success measures used in this study, i.e. client satisfaction, perceived quality and implementation process. Based on the regression analysis, it appears to be a significant predictor of two of these measures: client satisfaction and perceived quality. Thus, a

conclusion can be made that the development of a baseline plan may improve the likelihood of client satisfaction and perceived quality.

Business case development appears to be also positively related to all of the success measures. However, the regression analysis demonstrated that it can be only considered as a significant predictor of the implementation process success measure. Thus, developing a business case may improve the likelihood of the implementation process success.

Scope planning and risk planning practices have been also considered in this study as they were indicated by the literature to have a positive effect on the project success as well; but this study fails to support this claim. Both correlation and regression analysis did not indicate significant relationships between these two measures and the project success measures. Therefore, it can be concluded that if Macedonian companies want to experience successful ERP implementations, they should put more effort into developing a business case and developing a baseline plan.

Because of the small sample size, the results obtained in this study are sample specific and cannot be generalized.

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APPENDIXES

TABLE OF APPENDIXES

Appendix A: Questionnaire- English Version

Survey

Project Planning Practices and ERP Implementation

As part of my Master's Thesis research at the Faculty of Economics in Ljubljana, I am conducting a survey in order to discover what planning practices Macedonian SMEs pursue when implementing Enterprise resource planning (ERP) software for internal materials management and what is the level of success of the implementation itself. The survey is anonymous and all the information collected will be used only for this research. Thank you very much for your time.

I General Information

Please choose one of the indicated answers.

1. In which industry is your company operating?
   - ○ Industry, construction and energy
   - ○ Transport, tourism, retail, wholesale and other services
   - ○ Agriculture
   - ○ Others (please name it)_____
2. For how many years do you have your ERP software?
   - ○ Up to 1
   - ○ 2-3
   - ○ 4-5
   - ○ 6-7
   - ○ Over 7
3. How many months did the implementation of the ERP software take?
   - ○ Up to 2
   - ○ 3-5
   - ○ 6-8
   - ○ 9-11
   - ○ Over 11

II Business Case

This section tries to evaluate practices involved in development of a business case for an ERP project. Please indicate how strong you agree or disagree with the following statements by selecting the right number.

Before the ERP implementation:	Scale of Importance							
	Strongly disagree	Disagree	Partially disagree	Neutral	Partially agree	Agree	Strongly agree	Not applicable
4. Overall, the analysis we conducted before deciding to implement the ERP was thorough and methodical	1	2	3	4	5	6	7	8
5. We identified the main value drivers of the ERP implementation	1	2	3	4	5	6	7	8
6. We conducted systematic identification of alternative ERP solutions	1	2	3	4	5	6	7	8
7. We conducted systematic selection of preferred ERP solution	1	2	3	4	5	6	7	8
8. We evaluated the fit between the ERP implementation and the corporate strategy	1	2	3	4	5	6	7	8
9. Relevant departments participated in the planning process	1	2	3	4	5	6	7	8
10. Team/responsible person was committed to project goals	1	2	3	4	5	6	7	8

III Scope Planning

This section tries to evaluate practices involved in scope planning of an ERP implementation. Please indicate how strong you agree or disagree with the following statements by selecting the right number.

Before the ERP implementation:	Scale of Importance							
	Strongly disagree	Disagree	Partially disagree	Neutral	Partially agree	Agree	Strongly agree	Not applicable
11. We defined the goals that we wanted to achieve with the ERP implementation	○ 1	○ 2	○ 3	○ 4	○ 5	◉ 6	○ 7	○ 8
12. We defined all the outcomes that should have been delivered during implementation	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7	○ 8
13. We did not define the most significant events that should have occurred during implementation	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7	○ 8
14. We defined the requirements that the software should have fulfilled	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7	○ 8
15. We did not consider all the constraints we had to cope with during the implementation	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7	○ 8

IV Baseline Plan

This section tries to evaluate practices involved in development of a baseline plan on an ERP implementation. Please indicate how strong you agree or disagree with the following statements by selecting the right number.

Before the ERP implementation:	Scale of Importance							
	Strongly disagree	Disagree	Partially disagree	Neutral	Partially agree	Agree	Strongly agree	Not applicable
16. We defined all the activities needed to execute the ERP implementation	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7	○ 8
17. We did not define the sequence of the activities	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7	○ 8

18. We defined the duration of the activities	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7	○ 8
19. We did not define the resources needed for activities execution	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7	○ 8
20. We established a detailed schedule for ERP implementation	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7	○ 8
21. We established a detailed budget for ERP implementation	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7	○ 8

V Risk Planning

This section tries to evaluate practices involved in risk planning on an ERP implementation. Please indicate how strong you agree or disagree with the following statements by selecting the right number. We have defined a team to work on the ERP implementation

Before the ERP implementation:	Scale of Importance							
	Strongly disagree	Disagree	Partially disagree	Neutral	Partially agree	Agree	Strongly agree	Not applicable
22. We conducted analysis of risks and their consequences	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7	○ 8
23. We created detailed plans for uncertainty reduction	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7	○ 8
24. We created detailed risk response plans	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7	○ 8

VI Success of the ERP implementation

This section tries to evaluate the success of an ERP implementation. Please indicate how strong you agree or disagree with the following statements by selecting the right number.

	Scale of Importance							
	Strongly disagree	Disagree	Partially disagree	Neutral	Partially agree	Agree	Strongly agree	Not applicable
25. The ERP implementation came within its original schedule	1	2	3	4	5	6	7	8
26. The ERP implementation came within its original budget	1	2	3	4	5	6	7	8
27. The ERP software that was implemented works	1	2	3	4	5	6	7	8
28. The ERP software is used by its intended users	1	2	3	4	5	6	7	8
29. This ERP software has directly benefited the intended users either through increasing efficiency or employee effectiveness	1	2	3	4	5	6	7	8
30. The implemented ERP software was the best choice among the set of alternatives	1	2	3	4	5	6	7	8
31. Important users, directly affected by the ERP software, make use of it	1	2	3	4	5	6	7	8
32. I was satisfied with the process by which the ERP software was completed	1	2	3	4	5	6	7	8
33. We are confident that non-technical start-up problems were minimal, because the ERP software was readily accepted by its intended users	1	2	3	4	5	6	7	8
34. Use of this ERP software has directly led to improved or more effective decision making or performance for the users	1	2	3	4	5	6	7	8
35. This software has a positive impact on those who make use of it	1	2	3	4	5	6	7	8
36. The results of the implementation of this ERP software represents a definite improvement over the way the users used to perform these activities	1	2	3	4	5	6	7	8

Appendix B: Questionnaire- Macedonian Version

Анкета

Планирање на ЕРП имплементација

Како дел од мојот магистерски труд на Економски факултет-Љубљана спроведувам анкета со цел да откријам кои практики на планирање ги користат малите и средните претпријатија во Македонија кога имплементираат деловно софтверско решение (ЕРП) за внатрешно материјално работење и кое е нивото на успех на самата имплементација. Анкетата е анонимна и сите инфорации кои ќе бидат соберени ќе бидат искористени исклучиво за целите на магистерскиот труд.

I Општи информации

Ве молам изберете еден од наведените одговори.

4. На која стопанска гранка ѝ припаѓа Вашата фирма?
   - ○ Индустрија, градежништво и енергија
   - ○ Транспорт, туризам, трговија и други услуги
   - ○ Земјоделство
   - ○ Други (Ве молам наведете)_____
5. Колку години го имате Вашиот ЕРП софтвер?
   - ○ До 1
   - ○ 2-3
   - ○ 4-5
   - ○ 6-7
   - ○ Над 7
6. Колку месеци траеше имплементацијата на ЕРП софтверот?
   - ○ До 2
   - ○ 3-5
   - ○ 6-8
   - ○ 9-11
   - ○ Над 11

II Бизнис случај

Овој дел од анкетата има за цел да ги евалуира практиките кои се однесуваат на креирање на бизнис случај пред да биде донесена одлуката за имплементација на конкретен ЕРП софтвер. Ве молам наведете колку силно се согласувате или не се согласувате со следните изјави, избирајќи го соодветниот број.

Пред ЕРП имплементацијата:	Целосно не се согласувам	Не се согласувам	Делумно не се согласувам	Неутрално	Делумно се согласувам	Се согласувам	Целосоно се согласувам	Не знам
4. Генерално, анализата што ја извршивме пред донесување на одлуката за ЕРП имплементација, беше детална и систематска	1	2	3	4	5	6	7	8
5. Ги идентификувавме главните придобивки од имплементацијата	1	2	3	4	5	6	7	8
6. Направивме систематска идентификација на алтернативни ЕРП софтвери	1	2	3	4	5	6	7	8
7. Направивме систематска селекција на претпочитаниот ЕРП софтвер	1	2	3	4	5	6	7	8
8. Направивме евалуација на тоа колку имплементацијата е во согласност со стратегијата на фирмата	1	2	3	4	5	6	7	8
9. Вработени од различни сектори учествуваа во процесот на планирање	1	2	3	4	5	6	7	8
10. Тимот/одговорното лице задолжено за имплементација беше посветено на целите на фирмата	1	2	3	4	5	6	7	8

III Планирање на обем на проект

Овој дел од анкетата има за цел да ги евалуира практиките кои се однесуваат на планирање на обемот на ЕРП имплементацијата. Ве молам наведете колку силно се согласувате или не се согласувате со следните изјави, избирајќи го соодветниот број.

Пред ЕРП имплементацијата:	Целосно не се согласувам	Не се согласувам	Делумно не се согласувам	Неутрално	Делумно се согласувам	Се согласувам	Целосоно се согласувам	Не знам
11. Дефинираме цели кои требаше да бидат постигнати со ЕРП имплементацијата	1	2	3	4	5	6	7	8
12. Дефинираме сите работи што требаше да бидат завршени со цел комлетирање на имплементацијата	1	2	3	4	5	6	7	8
13. Не дефинираме важни настани кои требаше да се случат во текот на имплементацијата	1	2	3	4	5	6	7	8
14. Дефинираме барања кои требаше ЕРП софтверот да ги исполни	1	2	3	4	5	6	7	8
15. Ги земавме во предвид сите ограничувања со кои требаше да се соочиме во текот на имплементацијата	1	2	3	4	5	6	7	8

IV Основен план

Овој дел од анкетата има за цел да ги евалуира практиките кои се однесуваат на креирање на основен план за ЕРП имплементацијата. Ве молам наведете колку силно се согласувате или не се согласувате со следните изјави, избирајќи го соодветниот број.

Пред ЕРП имплементацијата:	Целосно не се согласувам	Не се согласувам	Делумно не се согласувам	Неутрално	Делумно се согласувам	Се согласувам	Целосоно се согласувам	Не знам
16. Ги дефинираме сите активности потребни за спроведување на имплементацијата	1	2	3	4	5	6	7	8
17. Не го дефинираме редоследот на извршување на активностите	1	2	3	4	5	6	7	8
18. Го дефинираме времетраењето на активностите	1	2	3	4	5	6	7	8

19. Не дефинираме ресурси потребни за спроведување на активностите	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7	○ 8
20. Изготвивме детален распоред за имплементацијата	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7	○ 8
21. Изготвивме детален буџет за имплементацијата	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7	○ 8

V Планирање на ризик

Овој дел од анкетата има за цел да ги евалуира практиките кои се однесуваат на планирање на ризик при ЕРП имплементацијата. Ве молам наведете колку силно се согласувате или не се согласувате со следните изјави, избирајќи го соодветниот број.

Пред ЕРП имплементацијата:	Целосно не се согласувам	Не се согласувам	Делумно не се согласувам	Неутрално	Делумно се согласувам	Се согласувам	Целосоно се согласувам	Не знам
22. Направивме анализа на можните ризици и последиците од нив	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7	○ 8
23. Изготвивме детален план за намалување на неизвесноста	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7	○ 8
24. Изготвивме детален план за реакција на можните ризици	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7	○ 8

VI Ниво на успех на ЕРП имплементацијата

Овој дел од анкетата има за цел да го евалуира нивото на успех на ЕРП имплементацијата. Ве молам наведете колку силно се согласувате или не се согласувате со следните изјави, избирајќи го соодветниот број.

	Целосно не се согласувам	Не се согласувам	Делумно не се согласувам	Неутрално	Делумно се согласувам	Се согласувам	Целосоно се согласувам	Не знам
25. ЕРП имплементацијата беше завршена во рамките на предвиденото време	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7	○ 8
26. ЕРП имплментацијата беше завршена во рамките на предвидениот буџет	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7	○ 8

27. Имплементираниот ЕРП софтвер функционира	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7	○ 8
28. ЕРП софтверот се користи од страна на корисниците за кои е наменет	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7	○ 8
29. Овој ЕРП софтвер донесе директни придобивки на корисниците зголемувајќи ја нивната ефикасност или ефективност	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7	○ 8
30. Имплементираниот ЕРП софтвер беше најдобриот избор од групата алтернативи	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7	○ 8
31. Главните корисници кои се под директно влијание на ЕРП софтверот, го користат истиот	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7	○ 8
32. Задоволни сме од процесот на импелемнтација на ЕРП софтверорт	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7	○ 8
33. Сигурни сме дека почетните нетехнички проблеми беа минимални бидејќи софтверот беше брзо прифатен од корисниците	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7	○ 8
34. Користењето на ЕРП софтверот директно придонесе за подобрено или поефикасно носење на одлуки или извршување на задачи од корисниците	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7	○ 8
35. Овој софтвер има позитивно влијание на оние кои го користат	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7	○ 8
36. Резултатите од имплементацијата на овој ЕРП софтвер претставуваат дефинитивно подобрување на начинот на кој корисниците ги извршуваа активностите претходно	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7	○ 8

Благодарам многу!

Appendix C: Results on 1-3 Questions From the Questionnaire

Figure 1: In which industry does your company operates?

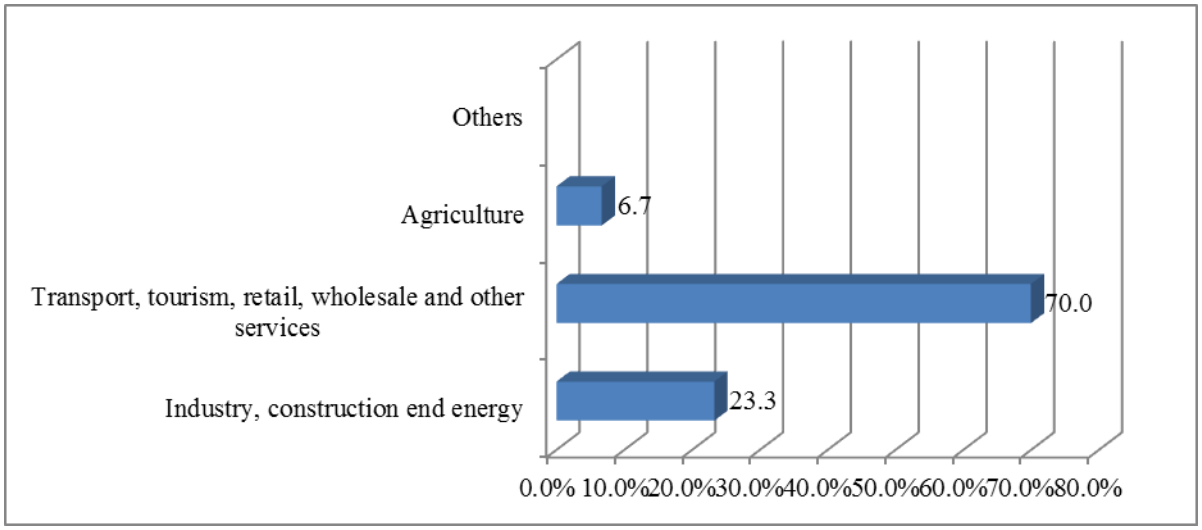


Figure 2: For how many years you have your ERP software?

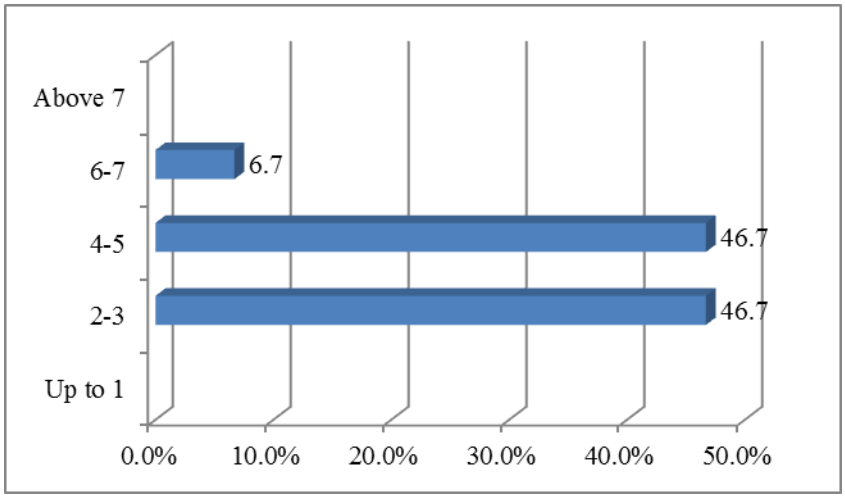
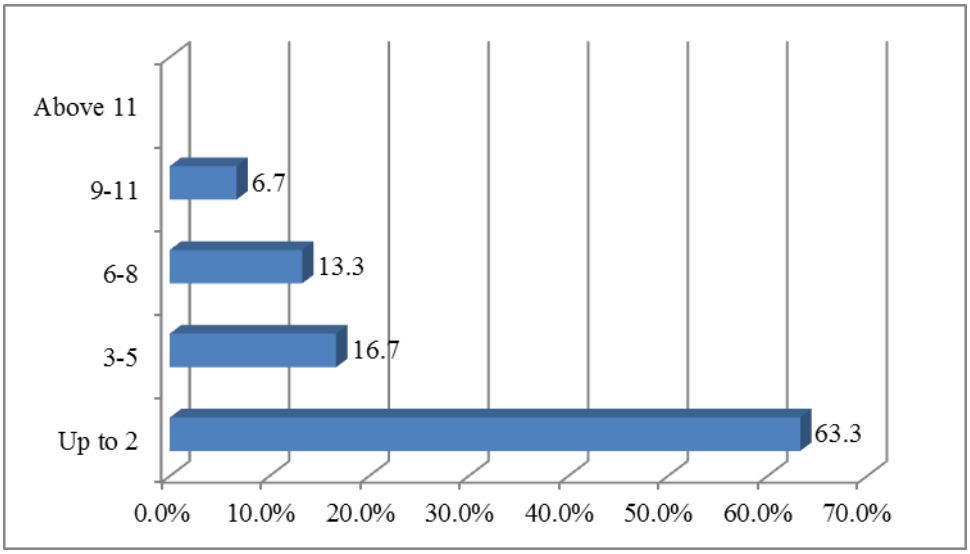


Figure 3: How many months did the implementation of your ERP software last?



Appendix D: Descriptives

Table 1: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
BC1	30	4.00	7.00	5.9333	.78492	-.338	.427	-.170	.833
BC2	30	4.00	7.00	6.0000	.74278	-.541	.427	.565	.833
BC3	30	3.00	7.00	5.7667	.97143	-.946	.427	1.144	.833
BC4	30	4.00	7.00	5.9000	.84486	-.537	.427	.014	.833
BC5	30	4.00	7.00	6.2000	.84690	-1.139	.427	1.275	.833
BC6	30	3.00	7.00	5.6667	.88409	-.867	.427	1.724	.833
BC7	30	4.00	7.00	6.3333	.92227	-1.308	.427	.897	.833
SP1	30	2.00	7.00	5.7667	1.25075	-1.225	.427	1.786	.833
SP2	30	2.00	7.00	5.6000	1.22051	-1.224	.427	1.583	.833
SP3	30	2.00	7.00	5.7333	1.31131	-1.336	.427	1.535	.833
SP4	30	2.00	7.00	5.6000	1.24845	-1.326	.427	1.728	.833
SP5	30	2.00	7.00	5.5333	1.19578	-1.057	.427	1.582	.833
BP1	30	2.00	7.00	5.7000	1.23596	-1.728	.427	3.877	.833
BP2	30	2.00	7.00	5.4667	1.22428	-1.367	.427	2.753	.833
BP3	30	3.00	7.00	5.5667	1.04000	-.584	.427	.788	.833
BP4	30	2.00	7.00	5.5667	1.25075	-1.352	.427	2.812	.833
BP5	30	1.00	7.00	5.1333	1.85199	-1.325	.427	.798	.833
BP6	30	1.00	7.00	5.2667	1.63861	-1.670	.427	2.139	.833
RP1	30	2.00	7.00	4.8333	1.17688	-.471	.427	.299	.833
RP2	30	1.00	7.00	4.4000	1.16264	-.446	.427	1.676	.833
RP3	30	1.00	7.00	4.3667	1.44993	-.334	.427	-.384	.833

Appendix E: Standardized Residuals and Modification Indexes

Table 1: Standardized residuals (Amos output)

	IP3	IP2	IP1	PQ4	PQ3	PQ2	PQ1	CS5	CS4	CS3	CS2	CS1
IP3	.000											
IP2	-.011	.000										
IP1	.060	-.012	.000									
PQ4	-.189	.127	.864	.000								
PQ3	.162	-.427	.646	.030	.000							
PQ2	.367	.147	.997	-.036	-.050	.000						
PQ1	-.611	-1.135	.121	-.023	.006	.063	.000					
CS5	-.720	.125	-.398	-.108	-.236	-.058	-.493	.000				
CS4	-.358	-.107	-.415	.017	-.312	.062	-.075	.059	.000			
CS3	-.206	.199	-.198	-.199	-.590	-.301	-.814	.257	-.165	.000		
CS2	-.361	.299	.216	.219	-.063	.574	.008	-.032	-.016	-.033	.000	
CS1	.225	.627	.257	1.310	1.037	.731	.681	-.188	.118	-.228	.089	.000

Table 2: Modification indexes (Amos output)

Covariances: (Group number 1 - Default model)

			M.I.	Par Change
e11	<-->	Perceived quality	4.020	-.225
e10	<-->	Perceived quality	4.425	.217
e6	<-->	Implementtaion process	4.106	-.168
e6	<-->	e11	4.262	-.122
e1	<-->	Perceived quality	4.428	.168

Variances: (Group number 1 - Default model)

	M.I.	Par Change

Regression Weights: (Group number 1 - Default model)

			M.I.	Par Change
PQ1	<---	Implementtaion process	4.331	-.144
PQ1	<---	IP2	5.845	-.125
CS1	<---	PQ4	4.686	.231
CS1	<---	PQ3	4.294	.252