Strategic and tactical success factors in ERP system implementation

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***Abstract*—** In order to successfully implement an ERP system it is necessary to properly balance critical success factors. By researching what the critical success factors in ERP implementation are, why they are critical, and to what extent they are relevant to users, consultants and suppliers, this paper seeks to identify critical success factors in ERP implementation and to understand the impact of each factor on the success of ERP system introduction. This paper lists ten critical success factors (CSF) providing two points of view: strategic and tactical. These are: top management support, a business plan and vision, top management support, change management program, project management, implementation strategies, project team, business process modeling and minimal customizations, monitoring and performance evaluation, software development, testing and troubleshooting, legacy systems.

***Keywords*—** ERP implementation, critical success factors, IT project, management

I. INTRODUCTION

Complex IT projects, such as developing and especially implementing ERP systems often fail.
Many studies indicate a small success rate in terms of exceeding the time limit, budget and poor functionality of the new system. Successful ERP projects bring great benefits to the company, but can also be devastating to organizations that fail to deliver. The aim of this paper is to further investigate the critical factors affecting the successful ERP implementation and to determine how they can reduce the failure rate.

There is extensive literature about ERP implementation issues, however due to high failure rate new research is necessary in this area, which may lead to new discoveries and thus contribute to reducing the ERP implementation failure rate. Additionally there is a lack of illustration of unsuccessful projects in literature, which further suggests need and importance of the broader study of factors affecting the successful ERP implementation [49].

II. CRITICAL SUCCESS FACTORS

Critical success factors are often used to identify and determine the key elements which are necessary for the success of business operation [22], and can also be described as a small number of easily identifiable operational goals, which are determined by industry, business, managers and environment, that ensure success for organization. Rockhart [34] explains that the formation of CSF can be considered from four viewpoints: those which are shaped by the industry, by operational strategies, by managers' perceptions and changes in environment. This paper will analyze CSF in ERP implementation from aspect of operational strategy, because vendors incorporate accumulated business practice knowledge from past implementations in many different organizations into ERP systems [40].

For determination of CFS it is necessary to fully understand categories of success and cost of ERP implementation.

A. Defining and measuring success

Defining and measuring the success of ERP projects is a difficult task, because it depends on the point of view. Project managers and ERP consultants often define success in terms of executing the project plan on time and within budget. Then, system users emphasize the importance of execution of operations without any difficulties in ERP systems and achieving business improvement [5].

An important factor in measuring success stems from the fact when success is measured [25]. Project managers and implementers can afford observation of success in the short term, but investors and company executives have long-term perspective [5]. Companies that have implemented ERP system should consider success in the long run, not just at the time of adoption [5]. In success measurement it is important to adopt the goals, expectations and perceptions of those who adopt the system as a standard for defining and measuring success. In this case the criterion of people who adopt the system is used to determine the actual level of achievement. But these subjective assessments may be unreliable because they use internal measures and targets that cannot be acceptable in every organization.

When implementing ERP systems we should also have in mind that this is not only an IT project, and that major decisions should be made by the business, since the implementation project is part of a business strategy. Although the choice of ERP system is very important for the success of implementation, the technology itself should not overshadow the business needs. If the selection and implementation are largely driven by computer experts rather than by business experts, the company runs a pretty big risk in finding the right answer to wrong question. In fact, everything should start from setting company strategic goals, and new system expectations, or a clear definition of what a new system should do. All functional areas of the company must express their

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opinion in order to have a successful project. Technology experts should have a lead role in choosing the technology that should be a pillar of the project.

B. Cost of ERP implementation

Total Cost of Ownership (TCO) is an important factor that affects the ERP strategies and decisions. It represents the total amount of costs that occur through system lifecycle [10]. TCO is affected with:

- Company size - larger volume of business requires a scalable system, capable of supporting a large volume of transactions.
- The number of ERP users - more users means more complex operation and access to input / output devices. Moreover ERP system vendors typically sell license by number and type of user.
- Functionality - the depth and breadth of functionality that will be supported by the system usually depends on the number of implemented modules.

Aberdeen Group conducted analysis in 2006 [1], within 1100 enterprises of various sizes, about total cost of implementation. Based on this study they perceived three different elements of the total costs associated with ERP implementation: the amount spent on software, the amount spent on external services and internal costs.

Additionally, various authors include the cost of hardware as part of total costs. For functioning of the ERP system you need the right IT infrastructure: servers, network components, workstations. However some of these costs can be avoided if the system is hosted.

Purchase of ERP software usually includes the cost of licensing which regulates the use of software. Typical price for a license depends on the number of end users and the number of implemented modules. Suppliers further complicate calculations allowing volume discounts that reduce the cost per module or per user. An ERP system also requires data storage and is also necessary to license a database. The cost of licenses for the database is usually based on the number of users who will enter the system or the number of processors.

Any implementation phase may involve the engagement of external resources including consultants, implementation specialists and project managers. Service costs are difficult to estimate, and usually represent the largest item in the ERP implementation budget. Although many project planners approximate these costs using the ratio of cost to the license cost of deployment, it should be noted that the implementation costs have more to do with the complexity of business processes that are being implemented, than the number of licensed users.

Certain software products can have an implementation ratio of 2:1, meaning that for every unit consumed on the software the user is planning to spend two units on the implementation costs. Often the ratio cost of services and software costs indicate the system flexibility and complexity of implementing advanced functionality.

Internal costs vary between companies and projects, so it is difficult to assess this component. The biggest factor of the internal cost is productivity loss of project team members, which, in addition to their regular duties, are involved in the implementation. Most project team members spend 100% of their time on project tasks in the most intensive phases of the project.

To estimate the internal costs, calculations can be made by Full Time Equivalent (FTE) that is needed for the project. FTE is calculated by multiplying the percentage of project members' time dedicated to the project with the length of their involvement in the project and with the total number of team members. The costs of staff training are often underestimated, although these are very high costs and organizations often makes mistakes forgetting that workers must adapt to new software and new processes. Training outside the company refers mainly on how to use the software, which is not enough, because the users need to learn the new way of work, and such knowledge can only come within the company. To use the software properly, persons that educate employees must have extensive knowledge on how processes run in other companies and how these processes are performed prior to the introduction of ERP systems. Therefore, the IT department and business together should ensure quality user training.

Finally, expenditure does not end when system is in production. Maintenance costs of hardware upgrade, the need for additional configuration and system support must also be taken into account. As well as implementation costs, maintenance and support can also be calculated as a percentage of the license cost. Many software vendors charge a periodic maintenance and support costs to cover occasional consulting, technical support, correction of bugs and upgrade to new versions.

Research shows that many companies underestimate TCO derived from these spheres. The biggest reason for this is underestimating and not knowing the total size of the internal costs. Research [1] has just confirmed that fact. Although internal costs make a significant part of total costs, a large portion of respondents did not offer the amount of internal costs, while for those respondents who offered the amount, it was significantly underestimated [1].

This fact has led to the conclusion that many companies have no adequate way of assessing internal costs, and although they account for significant part of total costs, they are not included in the elements of comparison in Aberdeen study [1]. A particular problem is the hidden cost of implementing ERP systems. One hidden cost is related to expanding the scope of the project. Data conversion costs are also hidden costs. Before the conversion of data from legacy systems, they must be cleaned. Data cleansing may require re-examination in order to align the necessary modification of the process.

Most of the old data is impossible to convert, so they must be manually entered into the new system, which means an additional cost of time and money. The costs of customization are related to the adjustment in terms of changing the standard ERP software and that should be avoided if possible. When ERP software cannot support a business process and a decision is made to change the standard functionality, such adjustments can affect every module because they are closely linked together.

With each new upgrade, you need to re-implement customizations, because they are not included in the new version. Because this is not vendor responsibility, organization should ensure that additional staff will work on such customizations and its future maintenance. Integration and

testing costs depend on the degree of connection between existing and new system.

ERP Integration Testing must be conducted through the process oriented perspective. Instead of data test from one application to another, it is advisable to initiate an actual order to pay process through the system, from purchase order entry through dispatch and receipt payments, with employees who actually perform the job.

Creating precise ERP implementation budget requires detail project team analysis from during the planning stage of ERP life cycle.

C. Definition and classification of critical success factors

Various CSF of ERP implementation and their different classifications of importance are cited in literature. Several authors have written about the successes and failures of ERP implementation, but mainly focus on narrow areas such as business strategy, technology or adaptation of the organization [21].

We studied the critical success factors cited by different authors [2], [14], [16], [20], [24], [27], [43], [44], [47]. Despite the diversity, the literature provides some critical success factors, which are commonly stated by the authors. After studying the various critical factors cited by various authors and based on our own experience we defined a group of factors which we consider important and associated with successful implementation of ERP systems.

By analysis, some factors are grouped into one factor because the authors believe that they are closely linked together. For example, the factor project sponsor has been placed under the factor top management support. Top management support is a broad term that includes all the activities from the support, approval, identification of project priorities and allocating resources. Another example is placing user education under change management program, because it includes components from recognizing the need for change to the education and training of end users and IT service.

In this way, we identified ten factors that are critical for the successful implementation of ERP systems: business plan and vision, top management support, change management program, project management, implementation strategy, project team, business process modeling with minimum adjustment, monitoring and performance evaluation, software development, testing and troubleshooting and legacy systems. Critical success factors should be classified within the specific criteria for easier understanding, like in model that was presented by Pinto and Slevin [31] and later expanded by Holland and Light [20]. It was Pinto and Slevin [31] who first argued that project managers must be competent in strategic and tactical aspects of ERP project management to successfully manage them. In order to clarify that they created a profile for ERP implementation project that consisted of ten critical success factors organized into strategic and tactical framework. Critical success factors were divided into strategic (planning) phase and tactical (action) phase of implementation project.

Strategic part is related to the project mission, top management support and project plan with detailed individual project activities. Tactical elements consist of communications between all stakeholders, including the necessary personnel in the project team and acquire the necessary technology and expertise for technical activities. User acceptance, monitoring at all stages and troubleshooting are also classified as tactical factors [31].

In this paper we selected their type of classification, because dividing critical success factors in strategic and tactical criteria contributes to easier understanding and highlights the differences. Holland and Light [20] have also grouped the critical success factors by strategic and tactical criteria. They emphasize the need for harmonization of business processes with software during implementation and argue that the strategy and tactics are interdependent. Benjamin and Levinson [6] also identified the need to manage the organizational, business process and technological changes in the overall sense. The strategy must drive tactics in order to complete the integration of three main managing processes: planning, execution and control [20].

Some authors consider that in addition to strategic and tactical framework, there is a cultural framework for dividing critical success factors. They argue that organizational culture significantly affects the implementation of ERP systems in the enterprise, and some individual factors are classified under this framework. Although the cultural factor in ERP implementation is extremely important, we believe that it equally affects all factors and leads to different results of ERP implementation. The culture is included in all the factors that directly or indirectly affect the ERP implementation process. When the two companies implement the same ERP systems, sometimes the outcome is quite different [39]. Technical problems can be analyzed and solved by the experts, but the human factor is much more difficult to manage. Adopted corporate culture is another factor that cannot be ignored in terms of ERP implementation success.

In ERP system implementation cultural factors incorporates organizational culture, communication and cultural differences between users, consultants and vendors. Organizational culture is divided into three layers [38]. The outer layer contains strategy, mission and the goals of the organization. In the middle layer there are beliefs that represent the topics that are discussed by the employees.

The inner layer contains assumptions that are taken for granted, and representing those aspects of organizational life that is hard to explain. All these cultural aspects will affect the organization operations. Culture with shared values and goals leads to success because it emphasizes quality and readily accepts new technologies and helps significantly in implementation effort [24]. Since they are strategic solutions, ERP systems will change the way people used to work. Innovative, open organizational culture will facilitate user participation throughout the implementation process. Open and creative culture recognizes employees as their primary source of ideas, actions and performance, resulting in a stable work environment that enhances employee loyalty [37]. On the other hand, organizational culture that does not support learning and sharing of information will discourage employees and affect the possibility of failure in the implementation of the new ERP system.

Effective communication is a key factor in organizational and individual success. The way that we receive, and associate the message in the organization can be crucial for success of the

implementation of ERP systems [19]. Effective communication can facilitate the penetration of the new system in the organization. It should involve all levels of business, from senior management to operations, as they all will be familiar with the changes in business processes that bring the introduction of the ERP system, which will affect their powers and duties. Effective communication promotes desire to participate in the changes and brings acceleration of business process reengineering.

Constant communication also helps in eliminating resistance of the new system introduction, throughout the business. Briefing on what is changing, why it is changing and how it will help the organization is important for the project acceptance [29]. Therefore, effective communication must be established and supported through entire company, while ERP system implementation is ongoing.

Communication includes formal promotion of the project team and informing rest of the company about project progress. On the other hand, the communication between internal and external groups (vendors and consultants) cannot also be ignored. Good communication can maximize support from vendors and consultants, which ultimately means that the company can better utilize their technical resources.

Cultural differences between users, consultants and vendors indicate not only organizational culture but also national culture. Trompenaars [46] points out that the national culture can be described in three levels: how people relate to each other, in attitude toward time and attitude toward the environment. According Coulianos et al [13] there may be two problems. First, vendor culture, incorporated in the ERP package, is in conflict with the organizational culture of the user. Second, few consultants understand the organization's culture and user business processes.

So, a common problem with the implementation of ERP systems is gap between the functionality offered by the package and functionality needed by company. To bridge cultural diversity, companies must choose between the change of organizational culture and business processes to fit into standard ERP systems or customize package so that software functionality will support their business processes. Thus, companies must take into account the cultural differences between software vendors, consultants and themselves before they decide which ERP system will acquire and implement. Otherwise, there could be serious problems with the project progress or even it can lead to failure [28].

Taking into account all classifications and our experience on ERP implementation projects, we divided critical success factors into strategic categories: top management support, business plan and vision, change management program, project management and implementation strategy; and tactical categories: project team, business processes modeling with minimum customizations, project controlling and evaluation, software development, testing and troubleshooting, legacy systems.

III. Strategic factors of ERP system implementation

We are listing, by criteria of importance, strategic factors which are influencing long-term, strategic business objectives, and are critical to the success of ERP implementation: top management support, business plan and vision, change management program, project management and implementation strategy

A. Top management support

Like many authors, we also recognized top management support as one of the most important critical success factor of ERP implementation. In order to be successful, project must have top management support [7], [26], [41], [45]. Top management must publicly recognize ERP implementation project as top priority, be personally involved in project, and in that way increase commitment of all employees [41]. This insures greater commitment on all organization levels, which is key factor of ERP implementation success [7]. It is not good enough that top management is personally engaged in project, but they also have to allocate valuable resources for the implementation project [20]. This includes not only the provision of adequate number of resources and time to complete the work, but essential personnel [33]. Some companies place the responsibility for ERP implementation in the hands of the technical department and thus make a vital mistake that often results in project failure. Thus, we can only conclude that the involvement of the IT department in ERP implementation is not enough, but the main initiative should come from top management, and IT specialists and top management need to collaborate and establish a partnership in order to have successful ERP implementation project. It is also necessary that the project has a sponsor from top management level, which is capable of implementing organizational changes whenever is necessary. Project sponsor is critical for achieving consensus and monitoring the entire life cycle of ERP system implementation [36]. Somebody has to act as a system advocate throughout the organization, and that has to be a high-level sponsor who has the power to set goals and justify the change [15], [42], [45]. For big and costly projects sponsor should be a strong individual with a high position in the hierarchy that will act as promoter of the system [35]. In addition, sponsor leadership skills play a key role in the implementation success, because sponsor must be able to resolve conflicts, deal with resistance, and manage changes [30]. Complexity of ERP projects often force employees to have additional working hours, besides their regular duties and that may lead to stress and lower their morale. So the role of sponsor is to promote ERP implementation project through entire organization and increase morale and commitment of all team members.

B. Business plan & vision

There should be a clear business plan and vision behind ERP implementation project. Project goal is not only implementing ERP system but achieving specific business objectives. While continually improving ERP implementation process, organizations should establish long term vision [37]. Holland & Light [20] put emphasis on need for clear goals and benefits that are easy to recognize and measure, and Shanks [42] argues that goals should be clearly defined and understandable. Rosario [36] emphasizes the importance of having a business plan, and Wee [48] states that the business plan must be a general overview of the strategic and tangible benefits, resources, cost, risk and time frame. These goals are

necessary in order to be tracked and measured during implementation cycle.

Changes in business process that are aligned with future vision and organization strategy should serve as justification for investment in ERP systems [15].

C. Change management program

With structural changes that include people, organization and cultural change, must be managed [36]. It is very important to recognize need for change, because the greater the need for change, the more likely that the top management and shareholders will support the implementation of ERP systems [15]. User resistance is connected with almost every change, especially with the change of a large information system like ERP [17]. Main concern is that their work will be eliminated or altered from the common way they have been used doing it, and they can become less productive when transferred from previous positions [4]. Appleton [3] also noted when the organization moves toward a complex information system (e.g. ERP), changes in employee relations are probable. Some employees will need to build new working relationships, a new exchange of information between departments and take on additional responsibilities. This can lead to resistance, confusion and fear. Therefore, successful implementation requires managers who possess good communication and team building skills [3]. It is highly recommended to involve users in the design and implementation of new business processes and ERP systems. Formal education and training are necessary to help users understand how the ERP system will affect their work [20]. In that way there will be higher degree of project acceptance in organization. Companies usually underestimate the need for formal education and in that way through underestimating internal costs they are affecting ERP implementation budget. User involvement from the beginning of the implementation process is also recognized as a key activity for acquiring customers for the project [12]. Users must have a role in the project activities like ERP selection, suggestion for technical approach proposed by the designers of the system and in the management and control activates. Accordingly, many companies develop formal communication plans and issue regular status reports in order to achieve a greater level of acceptance of the ERP project [12]. In the case of ERP selection, users can help in determining what is the efficiency achieved in the provision of services. Such participation and involvement of users is important to ensure that customer needs are met, and allows the project team to address their concerns and avoid resistance.

D. Project management

Individual or group should be given the authority to manage the project [36], because ERP implementation projects are usually estimated by level of achieving planned budget and time. Jiang et al [23] suggest that a competent project manager is the second most important factor in the implementation of information systems. ERP project managers must be credible in technical and business knowledge, make effective decisions and coaching own team members. They also have to manage expectations of managers and end-users properly and promote the project's benefits to the entire organization. Project scope definition is crucial for the success of ERP implementation [37], and several authors have pointed out that the scope of the project in terms of number of systems that are implemented, involvement of business units and the necessary modification of business processes, should be clearly defined and controlled [20], [36], [41].

All proposed changes must be assessed against the business benefits and, if possible, implemented at a later stage. In addition, a request to expand the scope must be evaluated in terms of time and additional costs resulting from the proposed changes [45]. It is also necessary to define project milestones with a clear and realistic delivery dates and the escalation of issues and conflicts should be managed [36]. Unrealistic deadlines and budget, the departure of personnel, lack of motivation and effort and lack of measurement are some of the key issues that are discussed in the literature, and if we want to have a successful project we have to manage them effectively [8, 9].

E. Implementation strategy

There are two main ways of implementing ERP systems: Phased approach and Big Bang [10]. Phased approach is slower way of implementation in which the ERP system is introduced by function (module by module) or by geographic areas.

In the phased approach, the project team can focus on specific functional areas of the company, while the other functional units are continuing with their normal operations. A phased approach is less risky than a frontal approach, because the each phase of the project ends separately and individually leading to success, which encourages the project team and serves as a reminder of the project throughout the business. Phased implementation can develop a positive competitive spirit between departments in terms of which department will quicker and better implement the new system. Also, this implementation can help other departments in learning how to develop the best solution for their department.

There can be several phases in the implementation. Thus, it can be determined that in the first phase finance module and human resource management module will be implemented, in the second phase inventory management module and sales module and in the third phase module for production.

Plenty of time can also be a negative side of a phased approach, because a lack of urgency leads to fatigue, causing employees to become exhausted by long and constant changes. Instead of finishing project in a shorter period of time, this approach involves changes over a longer period, which can be exhausting for employees. This can ultimately lead to dissatisfaction and doubts that the project will ever end.

Big Bang approach is more aggressive way in which implementation of the entire scope of the project is addressed through the entire company at once.

Big Bang is preferred method by companies that have an immediate need for solution delivery.

Companies using Big Bang approach are generally smaller and less complex than companies using phased approach, which makes it easier to put entire ERP system in to production at once. Big Bang implementation strategy is the most efficient in terms of cost but also the most dangerous solution because of the speed and the demanding nature of this

approach often leads to overlooking important details. Projects using the Big Bang approach often results with lower satisfaction of the implemented system, because its inability to satisfy important business requirements.

Additionally, roll-out implementation strategy can be combined with these implementation strategies by increasing or reducing the functional scope.

Roll-Out strategy refers to a specific region or business unit to which an implementation model is created, which is then used to implement the solution at other locations or business units. For example, a company that operates in the U.S. and Europe can choose a model and implement ERP system for most of its functionality in the U.S., and then in a subsequent phase, implemented and tested solution in Europe. Similarly, a company that has multiple business units can begin implementation of a business unit, and then using the experience to introduce the solution to other business units.

Selection of an implementation strategy will determine time and resources or people and money. Size and goal will also affect the choice of implementation strategy. There are many other cases that may affect the choice of the right strategies such as merger or split of the company, the new legislation, improvement of software functionalities of the current system, the need for reengineering business processes and reduce costs within the company's programming, etc.

IV. Tactical factors of ERP system implementation

This chapter gives an insight into five tactical factors that affect short-term operational goals and are critical to the success of ERP implementation.

Holland and Light [20] emphasize the need for harmonization of business processes with software during implementation. Furthermore, they claim that natural strategies and tactics are not independent of each other. While the strategic factors affect the long-term goals, tactical factors are focused on short-term operational goals. The strategy should drive a tactic to fully integrate three main management processes: planning, execution and control.

A. Project team

Project team is important factor of successful ERP implementation and it was recognized as critical by many authors [7], [20], [24], [36], [45]. ERP project requires cooperation of technical and business consultants and end users. Therefore, teamwork and composition of the project team by the implementers, consultants and suppliers is emphasized in the literature. Somers and Nelson [43] points that key element of successful ERP implementation is having competent project team members. Capable project members can understand and explain new concepts and processes better, in addition to satisfying the technical requirements of the project. ERP team should be composed of external consultants and internal employees, so that internal people could develop the necessary technical skills to design and implement an ERP system. The implementation team also needs to be multidisciplinary, composed of technical specialists, key users and operating personnel, as well as consultants with the necessary skills and knowledge to design and redesign of business processes [11]. Furthermore, the project team members must be empowered to make quick decisions [41] and must be assigned to the project full-time to ensure their focus on the project and provide a smooth flow of the project. Knowledge exchange between implementing partners, is necessary and requires the trust and must be managed at regular meetings. Sharing risk and reward will contribute in working together and achieving goals [48]. Often, companies do not fully understand the importance of selecting the best employees with appropriate skills for the project. Appropriate staff for the project is not only those who possess knowledge of the processes in the company, but those who possess knowledge of best business processes in industry. Ignoring project needs and the inability to provide leadership and guidance by the project team is the main reason for the failure of ERP projects. Functional areas that are not willing to share their resources have to be indentified and problems should be overcome, because that can compromise the success of the project [7]. Haines and Goodhue [18] emphasized that the interaction between consultants and employees has a direct impact on the success of ERP implementation. Companies often seek the help of external consultants when they have problems with highly centralized organizational structure or lack of experience [32]. In highly centralized organizations, top management is often not familiar with the actual operational processes. Therefore, consultants and vendors act as mediators which break barriers in knowledge between the different management levels in the organization. Consultants can assist in the system analysis, assisting the company in defining the business processes from the lowest levels up to senior management. They can also recommend the most appropriate hardware and software and help in system implementation. The need for consulting support in the implementation of ERP systems is higher than in other IT projects, because the ERP implementation project requires a wide range of skills and knowledge such as change management, risk management, business process modeling and additional technical knowledge. Additionally, the ERP system is based on programming languages and concepts that are probably unknown to the existing IT staff and consultants can help enterprises to overcome difficulties by offering their experience and knowledge. They can provide training to develop skills and knowledge that the company lacks. However, companies should not fully rely on consultants, as they have limited knowledge of the operational activities of specific companies. Thus, although consultants and suppliers are knowledgeable about best practices in the industry, only people within the company know more about its operating business, and management must carefully analyze each situation rather than to accept any suggestion of consultants and software vendors.

B. Business processes modeling with minimum customization

Business process modeling is a methodology that enables companies to determine their business processes as a series of activities and transactions that together achieve specific business goal. Business processes modeling is an approach

focused on understanding the basic business processes and development of business processes repository, where business rules are one of the most important element for detailed and formalized description of all facts that will be implemented during the development of information systems. Implementation of ERP software will bring many changes in business processes, and companies must be willing to accept embedded business practices, and model their processes, whenever it is possible [20], [41]. Wee [48] points out that once the system is in use reengineering should proceed with new ideas and upgrades to take advantage of all opportunities offered by the ERP system. Configuration of the ERP software is different from building custom systems because focus shifts from analysis and development to software configuration [20]. Philosophy of business process modeling is based not only on the aligning business processes with software, but also in simplifying business processes by eliminating redundant activities. There should be minimum ERP system customizations, in order to reduce possibility of mistakes. In that way also it is easier to upgrade software to new release and version. Sometimes companies do complex customizations which are often unnecessary, because departments or individuals who initiate changes don't fully understand business practice in the company or the relationship between several business processes [30]. It is important that companies indentify their business processes and connect them with business processes embedded in ERP system, at the beginning of the project. This helps companies to avoid unnecessary customizations that are often initiated because of misunderstanding business practices, and resistance to change.

C. *Project controlling and evaluation*

Somers & Nelson indicated that there is a need for frequent updates of project status and progress for timely corrections and to keep project on right track [43]. Because of complexity of ERP system there is constant risk that there will be issues during implementation cycle. They can cause delays and disrupt the project timeline, so they must be constantly monitored and assessed. In order to track the impact of ERP implementation on overall business performance managers needs information. Companies design regular reports that give information about the progress of the project. Each issue should be assed and classified by priority, and the most critical issues should be marked as 'show stoppers' and escalated. In order to track status and progress of the ERP project, milestones and targets should be actively monitored [30]. Project control and evaluation includes exchanging information between project members and analyzing the feedback received from end users [20]. Team morale is a significant component of project success. Since team members are required to spend a large part of time on project, and with the stress from usual duties, they very quickly lose morale [36]. So there should be evidence of success and project progress in order to motivate team members and that can be achieved by constant control and evaluation of project status. Project manager with extensive knowledge of operational processes will ensure good control of project progress, as he would be responsible for project outcome [12].

D. *Software development and troubleshooting*

Customizations of ERP system should be avoided whenever is possible. However sometimes they are necessary in order to preserve the specific business processes that create competitive advantage for a specific company. ERP system integration with systems developed within the company and with specialized software products, serving the specific industry needs, is necessary to achieve the full benefits of implementation, and sometimes companies needs to develop their own interfaces to achieve such integration [7]. Therefore software development must be well specified and documented in terms of functional and technical design. Murray and Coffin [30] pointed out that the use of appropriate methods of modeling, architecture and tools can help to achieve successful ERP implementation. Holland and Light [20] stated that troubleshooting is critical to the success of the ERP project. During software development, problems in functionality may occur. In order to detect and eliminate such bugs, rigorous and sophisticate testing should be conducted [36]. Quick response, patience, perseverance and the ability for quick actions are important for solving problems [36]. Therefore, active cooperation of users, vendors and consultants is essential to address and eliminate problems.

E. *Legacy systems*

The legacy systems include existing business processes, organizational structure, culture and information technology [24]. Inevitably, they determine the amount of organizational change required for successful ERP implementation and determine the starting point of implementation [20]. By assessment of legacy systems, the nature and extent of the problems that will be encountered in implementation can be defined. For example, if the legacy system is extremely complex, with different technology platforms and a multitude of procedures for managing business processes, then the amount of technical and organizational change is huge. If the company already has a common business processes and a simple technical architecture, the changes are small. According to Roberts and Barrar [33] it is essential to have stable and successful business, for a successful ERP implementation. They state that a stable and successful business leads to a strong organizational identity which is open to changes, and creates bigger chance for a successful ERP implementation.

V. CONCLUSION

Successful implementation of ERP system encompasses many different tasks. It is very difficult to focus equally on all factors affecting the implementation of ERP systems. Goal of this paper is to recognize the importance of individual factors, their impact on implementation success, and how to allocate limited resources on the critical factors.

This paper presents ten critical success factors which are classified as tactical and strategic success factors for implementing ERP systems. Strategic factors influence the long-term goals and tactical factors are focused on short-term goals.

The ERP implementation project must have strong support from top management, who must be prepared to allocate

resources for the project. Implementation of ERP system must have a clearly defined business plan and vision. The business plan must contain a review of strategic and specific benefits, costs, resources and time frame, while the vision must be clearly identified and linked to business needs.

It is necessary to manage the structural changes that include people, organization and a cultural change. It is also very important to involve users in the design and implementation of new business processes and to organize education and training so that employees can recognize how ERP system will affect their jobs. A Good project management is essential, because success in implementing ERP systems is usually based on the realization of the planned time and budget. The project must be well managed and guided, and project scope should be clearly defined and controlled.

Applying appropriate strategies reduces implementation risks, because strategies and methodologies incorporate experience of all those who participated in the ERP implementation projects.

Project team is one of the key tactical factors in implementation of ERP systems. It is important to have a team of experts from several functional areas. Confidence among team members is also very important. In the process of implementing ERP systems, business processes changes will happen in order to utilize best practices offered by the system. Companies need to adopt best practices and model their business processes towards them.

It is important to emphasize that the project methodology must be performed in clearly structured steps with milestones, and project monitoring must be established.

The whole process must be documented in details, which will provide easier maintenance in later stages. Detailed implementation documentation provides easier monitoring of certain activities and enables team members' communication. Development and testing of the software must be well organized and conducted. Quick response, patience and persistence in problem solving are very important for the successful implementation of the project.

Legacy systems include company existing business processes, organizational culture and information technology and determine the starting point of implementation. They determine the amount of organizational change required for successful implementation of ERP systems. Culture is involved in strategic and tactical factors that directly or indirectly affect the ERP implementation. Adopted corporate culture cannot be ignored in terms of ERP implementation success.

Implementation of ERP system should result in satisfied customers, whose business processes are well supported and that have achieved business improvements. On the other side vendor should be satisfied with new reference, and continuous cooperation with existing customer, and possibly acquire new customers.

Successful ERP implementation is not complete with the new system in production, because organization should perform continuous process optimization, improvement and maintenance of the system to adapt to the ever changing needs of the business.

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