Improved Project Management Practices as a Key to the Successful Information System Implementation

Željka Požgaj

Faculty of Economics and Business, University of Zagreb
J.F.Kennedy Square 6, 10000 Zagreb, Croatia
E-mail: zpozgaj@efzg.hr

Hrvoje Sertić

Research & Development Center, Ericsson Nikola Tesla
Krapinska 45, 10000 Zagreb, Croatia
E-mail: hrvoje.sertic@ericsson.com,

Alen Škatar

Sales department, T-HT d.d. - Region 3 west
Ciottina 17a, 51000 Rijeka, Croatia
E-mail: alen.skatar@zg.t-com.hr

Summary

Project organization for the information system development is a highly demanding task. To enable efficient implementation, development project team must be able to capably perform development tasks and quickly respond to all sorts of change requests. Traditional project organization methods are no longer suitable to answer all challenges related to the information system implementation caused by the customer demands.
This work analyzes typical project organization practices and proposes method to organize information system development projects in a way to enable efficient use of available competences and provide a way to implement changes during the project execution. Proposed method is applied and evaluated on the actual development project to present all advantages of proposed approach.

Key words: software development, project management, information systems

Introduction

Companies today require highly complex information systems (IS) which are used as a main business foundation and primary connection with customers and partners. Development of such systems has changed significantly over the last several years: from small development organizations and just a few developers,

IS development currently is performed by complex development organizations with large number of developers, who are structured into complex organizations containing large projects split into several sub-projects executed by different development companies. Conditions on the global market force developers to implement IS in tremendously short time frames by utilizing most advanced technologies [Berkun, 2005]. The role of project manager has also changed significantly: from main technical developer, project manager has become primary driver of the project execution. This means that the project manager must be able to organize all aspects of project execution, from work on requirement collection, through implementation and testing to IS introduction on customer site. Ability to rapidly respond to customer's change requests has become one of the key project managers' skills and precondition for efficient IS implementation.

Amount of knowledge required to implement successful IS has also increased significantly: beside high amount of knowledge required to use advanced software technologies, software developers must be able to understand complete business environment in which customers operate in order to implement usable IS [McConnel, 1996]. Customers nowadays demand highly customized development according to their particular requirements; mass-produced IS can no longer be used to gain competitive advantage on today's global market.

Typical development practices, in which IS requirements are frozen on the project start are no longer suitable, since environment in which IS will be used changes so rapidly that it is no longer to completely define required IS functionality in advance. Customers can no longer wait for the IS to be implemented to try its services and verify its behavior; instead they must be able to constantly verify implemented parts of IS during implementation and make corrections necessary to implement IS according to their particular needs. This has significant impact on project organization: to answer all customer requests, complete development project must be organized to deliver usable parts of IS as soon as possible to customers for verification, all change requests made by customers must be quickly accepted and implemented, and complete available competences must be efficiently utilized [Schwalbe, 2007].

This work analyzes typical development practices and project manager role in today's complex project organization and planning, knowledge utilization and role assignments, requirement definition and change management, with particular focus on development improvements. Method for project organization according to the available competences aimed to enable rapid implementation of customer change requests is proposed and evaluated on actual development project to present all benefits which improved project management practices can bring to the IS development.

This paper is organized as follows: after the introduction, typical development practices and project manager role in these practices are analyzed. Third section presents method for project organization according to available competences,

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while fourth section presents results of method application on actual development project. Conclusions are given at the end.

Project manager's role in development organization

Typical development organizations usually have some sort of formal organization, which defines high-level roles for most of development team. This means that typical development teams usually have predefined basic roles, so that it is, even before project start, on high level defined who will define system architecture, and who will perform design, test and integration activities. On the contrary, most project managers are assigned to the projects on the assignment basis, meaning that they get responsibility for execution of particular project or several project phases. Complexity and dedicated scope of today's IS causes development organization to frequently change development area, since it is not likely that any development organization can survive by implementing IS from just one dedicated area [Schwalbe, 2007]. This impacts organization of development project, since project manager must be able to analyze competences of available developers and assign temporary project roles in order to provide foundation for most efficient utilization of available competences. Proper role definition and assignment represent significant challenge on every development project: project manager must found a way to assign project roles according to the personal preferences, but roles must also be assigned in a way to enable efficient cooperation between development team members and proficient software implementation. Typical problems arise when project manager fails to correctly identify available competences and creates inefficient project organization. Amount of change requests that typical project faces during project execution should cause project managers to constantly monitor and adjust project organization [Wysocki, 2006].

Project planning

In stable environment, project planning is relatively simple. Project manager typically assigns analysis team who analyze requirements and customer needs, perform technical investigation and create implementation estimations. Stability of requirements, experience in the development field and used technologies, together with available amount of knowledge about actual customer needs directly determine quality of initial estimations and quality of related project plans [Kerzner, 2006]. Problems arise if the development team doesn't have sufficient knowledge about development field, used technologies or customer needs and expectations. Project manager should be able to analyze quality of estimations he receives; project planning should in theory be based on accurate estimations created by technically competent developers. However, if the project is required to implement IS with advanced functionality using state of the art technologies, it is certain that most of development team will not be able to create correct estimations since they will have no experience in such environment.

Additional significant impact on project planning has customer's change requests and all changes project faces during execution. Even perfect project plans created on the project start have little value if project faces change requests so significant that the most of IS functionality should be altered [Berkun, 2005]. There are several strategies currently in use which propose IS development projects to be organized in several small development iterations aimed to implement just small parts of IS functionality [Schwalbe,2007], but there is no receipt that can be used to create quality project plans in the environment characterized with high amount of changes. Project organization and planning in such environment directly depends on project manager and development team skills in responding to change requests, adjusting project organization, roles, and development activities towards main goal: delivering changed parts of IS functionality to actual customers as soon as possible.

Quality of project plans is usually measured by the amount of details they contain and the value of estimations they are based on [Kerzner, 2006]. According to our experience, this is not sufficient to judge value of project plans. Often project managers create complicated plans on the project start which contain large number of planned activities which are not even presented to project members or adjusted through the project execution. Proper project plan must clearly define what should be done on the development project, but project plan must also be accepted by all involved persons. This means that project plan must be analyzed and commented by all project members, presented to all involved persons (including IS customers) and constantly monitored and adjusted during the project execution. Project plan must also be stored on common place, so that it is easy accessible for all project members to get information about overall project goals, particular responsibilities and timing for major project phases.

Knowledge utilization and role assignments

Extremely short time frames for today's IS implementation project demand from each project member to efficiently utilize complete set of available competences. Usual analysis of available competences and role assignments so that the roles are assigned to the most appropriate competences is not suitable any more. Short time frames in which IS development project must be prepared for execution (by setting up project organization, gathering initial requirements and analyzing future IS environment), demands that every single preparation activity must be performed as efficiently as possible [Davis, 2005]. Simple role assignments according to the information about available competences usually results with several problems: people are not often motivated to perform efficient activities since they were assigned roles similar to the previous project, their actual capabilities remain unused since they were not considered by role assignments, and most of all, described practice doesn't help to create successful development team since it focuses to personal competences. Knowledge which

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project manager receives on the project start about available competences might be completely wrong; in lots of cases and situations development team members do not even receive a chance to perform activities which they are capable of due to the incorrect organization or other issues. If the project manager doesn't consider complete development environment, customer expectations, personal wishes and invest effort to create project organization that will enable each team member to perform activities in which he is interested in, project will face difficulties in execution which will have major impact on project preparation. Environment in which today's IS are implemented usually doesn't leave second chance for project preparation since most of projects simply do not have time and resources to repeat such activities. Major challenge for each project manager today becomes to create efficient project organization. From that perspective, it must be noted that implementation of successful IS under controlled development cost and resources is no longer major goal of the development project; instead, each development project must satisfy two major goals: (1) competence increase of all involved persons and (2) creation and advance of successful teams.

Requirement definition

Fulfillment of project requirements is one of the major responsibilities of each project manager. The role of requirements on development projects is often disregarded: requirements usually do not get properly defined, they are not used properly in development activities, test activities often do not verify which requirements are implemented, and customer changer requests do not update actual requirements used by development team [Davis, 2005]. Requirement discovery and definition so that they represent actual customer expectations is major task of each IS development project. Even properly defined requirements do not guarantee proper IS implementation according to the customer expectations; project must be able to systematically use requirements in each part of development activities to be sure that results of each activity contribute towards satisfying customer expectations. Requirements are often not properly structured: highly important requirements are mixed with not important ones; high level requirements are usually not properly represented with a set of low level requirements which completely clarify that requirement and so on. Projects often fail to properly on-time analyze defined requirements, so that in many cases development team late in execution discovers that the used requirements are incorrect or do not make sense. Proper requirement management practices on development project form a foundation for successful project, but they also require significant resources.

Change management

Changes have become integral part of each IS implementation project. Customers often demand implementation changes at very high frequency, developers

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usually discover that the implemented parts of functionality are not properly implemented or that the quality of implemented parts is not sufficient. Typical cause for project failure is inappropriate approach for change management [McCulloch, 2005]. If project manager fails to gather complete control over every single change that is introduced to the project, project will end up in confusion and it will become very difficult to know which functionality is actually implemented. Even worse situation happens when development team members introduce changes on their own hand. To avoid problems related to the change request, and to create foundation for quick change implementation, project manager must establish environment that will enable project members with technical knowledge to accurately analyze each change request and create estimations including all consequences of change implementation. However, decision responsibility about each change request must remain on project manager; only in that way project manager can have control about all implemented changes which will enable IS implementation according to the (changed) customer expectations.

Method for improved project management

Activities required to prepare and execute IS development project in complex environment are presented on the Figure 1. Method is focused to two main parts of the IS implementation: (1) preparation of the development project and (2) execution of actual implementation activities. Method proposes activities that should be performed by project manager through the project. Several important artifacts are presented with respective activities in order to stress valuable outcome of the particular activities.

Project preparation

Proposed method starts with in-depth analysis of the environment in which project is to be executed. Project manager should analyze assignment he receives from its own organization or actual customer. Particular focus should be put into analysis of available competences and skills of project members. Activity aimed to analyze complete project environment is defined to actually analyze all issues that might impact project execution. Goal of that activity is to gather as much as possible information about all project stakeholders, market situation, particular customer, people involved from own organization and any other external influences. Project manager should focus to analysis of the project environment to define set of constraints in which project must be executed. These constraints should be used as a foundation for creating initial project setup and assignment of actual development activities.

In the preparation project phase, project manager should focus to create three efficient project teams: (1) Team responsible for requirement gathering and definition, (2) Team expected to define initial IS system architecture and (3) Team responsible to prepare and perform testing. Roles in the initial project or-

ganization should be assigned according to the competences and interests of project members, but constraints identified in analysis activities should be also considered. Together with initial project setup, project manager has responsibility to define project objectives and present them to all persons involved into the project. The following objectives should be presented to the persons involved in the project: (1) Project goals in terms of main IS functionality and project scope, (2) Project time schedule including exact planned dates for delivery to customer, (3) Estimated project cost, (4) Required competences with the focus to customer requirements and used technologies, (5) Resources required for project execution and (6) High-level competence development plan with presentation of expected competence levels.
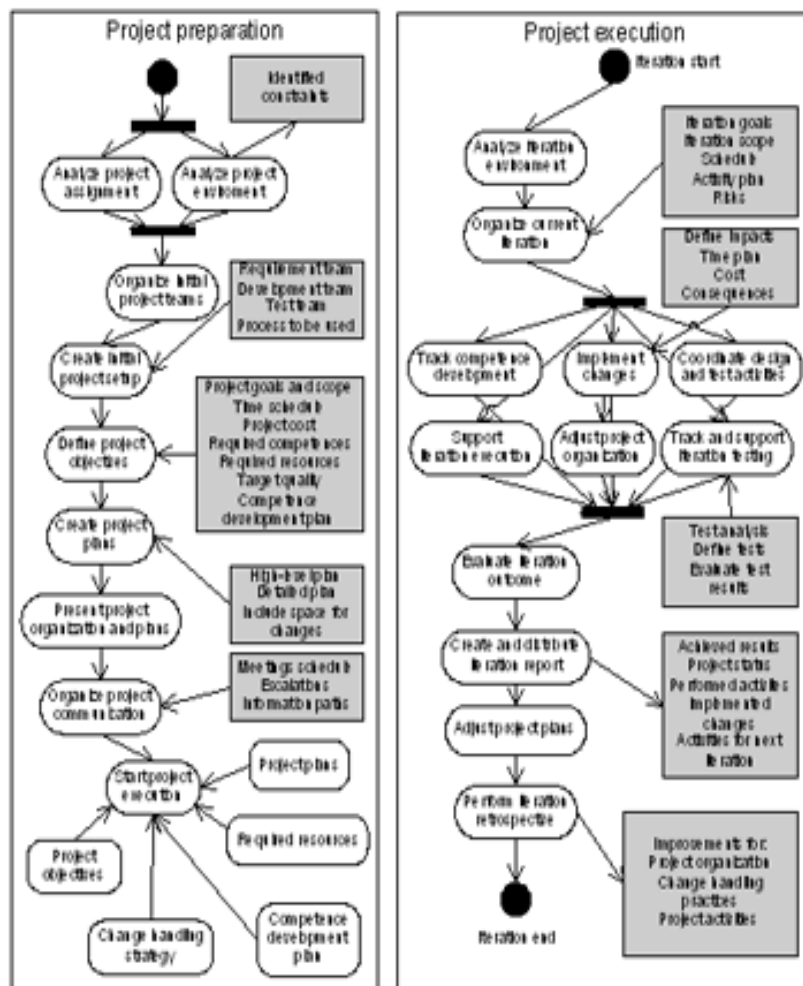

Figure 1: Method for improved project management

When most of project objectives are well-known, project manager and initial project teams can start working on creating project plans. Project plans should be defined on the following two levels: (1) High-level project plan with description of basic project phases, implementation iterations and definition of important project dates and (2) Detailed project plan with definition of particular development activities, their schedule and execution responsibilities. Project manager should assign project teams to create estimations for development activities, but actual project plans should be created only by project manager. It is crucial for complete project team to gain agreement and support for project plan, but creating utilizable project plan is responsibility of the project manager. Both project plans and project organization that will be responsible for execution of project plans should be presented to all involved persons. High-level time plan has the purpose to simply present actual project schedule as viewed from customer perspective to all involved persons, while the value of the detailed project plan is to inform project members about their responsibilities. Both project plans should include about 25% of time and resources for accustomizing changes received from the customer.

Prior to project execution, project manager should establish project communication practices by defining information paths that should be followed in common situation. Project manager should also propose change handling strategy by assigning roles responsible for analyzing change requests, creating and performing impact analysis and actual change implementation. This strategy should be connected with communication plan in order to enable most efficient information exchange in the case of received change requests. Methodology defines that the actual project execution can be started when the following is defined and agreed with complete project team: (1) Project objectives, (2) Project plans, (3) Change handling strategy, (4) Required competences and resources and (5) Competence development plans.

Project execution
Proposed method defines activities that should be performed by project manager in each development iteration. As with project preparation, method starts with environment analysis which is focused to the scope of the current iteration. Environment analysis should be aimed to identify major influences which can impact iteration execution. The following issues should be considered with the analysis: (1) Current situation in the project team, (2) Availability of required competences and resources, (3) Accuracy of project plans, and (4) Change requests which were issued prior to the current iteration. Information from these areas should be used to analyze current project organization and perform organization of current iteration by defining iteration goals, scope, detailed schedule and activity plan. Risk which might impact current iteration should be considered when creating iteration organization in terms that the planned activities are adjusted towards resolving most important risks. When the iteration imple-

mentation starts, the following tasks should be performed by project manager: (1) Track and adjust competence development of involved team members, (2) Organize, track and support implementation of change requests, (3) Coordinate design and test activities to minimize delays in testing by organizing development team to support testing and resolve all problems which occur during the test, (4) Support iteration execution by providing support to all project members and constantly improving project organization and (5) Track and support iteration testing. Method purposely defines separate activity for test support for project manager to stress the importance of iteration testing. Project manager should track test analysis activities, select tests that should be performed in the iteration and evaluate test results.

When the test team confirms that the iteration scope is implemented and when the test results are available, project manager should evaluate results of the performed iteration in terms of satisfied requirements and implemented change requests. It is the responsibility of project manager to confirm that the iteration has succeeded to implement planned scope and to decide if the iteration should be repeated or the project can proceed to further iteration. Project manager should create iteration report to represent current project status with description of all performed activities, achieved results, implemented changes, occurred problems and risks. Report should also describe achieved competence improvements and description of functionality that was added to the IS in the performed iteration, together with description of any functionality problems or limitations. Based on the iteration report and experience from the performed iteration, project manager should adjust project plans to reliably represent further project schedule and actual activities that should be performed. As a last activity in the current iteration, project manager should organize iteration retrospective, a project event where complete project team gathers to discuss achieved results, quality and efficiency of performed activities and all positive and negative experiences from iteration execution. Iteration retrospective should result with proposition for improvements in project organization, development and test activities, and change handling practices.

Results of method application

Proposed method was applied on the development project in the Ericsson Nikola Tesla Company for the development of IS aimed to provide statistics for mobile operator's network. Development project involved 24 developers located on four sites, with preparation phase and three development iterations. Focus on the environment analysis defined in the proposed methodology resulted with in-depth analysis of actual development constraints and several organizational decisions. Project objectives were defined on the project start and explained to all involved project members. By performing preparation activities as defined in the proposed methodology, project manager provided significant amount of information to project members, which were all aware of actual pro-

ject goals, schedule, their role and actual customer expectations at the project start. Each development iteration was organized according to the experiences from the previous one, and project plans were constantly adjusted (several times through iteration). Project faced significant number of change requests, which had major impact on project execution and required additional effort for implementation. By constantly supporting both design and test team, project manager enabled test team to perform all planned tests despite occurred problems in the code design. Iteration retrospectives were performed after every iteration and enabled development team to understand all decisions performed during the iteration. Several valuable improvements in project organization were defined according to the retrospective conclusions.

Conclusion

Current situation in the field of information systems development demands most efficient utilization of available competences and well-organized development activities. Traditional project management practices are no longer suitable, since the amount of change requests faced by the typical project demands from the project manager to actively participate in all project activities and, beside usual project management activities, to coordinate and adjust development and test activities. This work has analyzed areas of project organization to propose method that will enable project managers to focus to the important organizational issues and create efficient project organization that will enable all project members to increase own competences. Quick response to change requests is provided by defined activities which should be performed by project manager and project team members. Results achieved with method application on actual development project clearly show that the project organization can be constantly improved through the project, therefore resulting with better implementation of information systems.

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