OUTSOURCING OF SOFTWARE DEVELOPMENT: CHALLENGES FOR MANAGEMENT

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Abstract

The development of software applications for various functional areas has increased dramatically over the past 20 years as a result of both the rapid development of Information Technology (IT) and the demands of growing business. A large number of new Information Systems (IS) implemented in finance area are standard from-the-shelf applications made by large IT companies and adjusted or customized according to local business needs. In most cases such activities as investigation of business area and local functional requirements; standard IS selection, customization and further implementation is organised in the form of Project with its budget, schedule and resources. Adjustment and customization of Information Systems usually is done mainly by professional outsourcers as software developers. This article investigates the problem of successful management of a large Project implemented by involving not only own software developers resources, but also external outsourcers. The case demonstrates that by involving software outsourcers, the management of companies not only gets more opportunities for a successful launch of the Project, but also the challenge to cope with many underwater rocks while governing this development process.

Purpose – The aim of this article is to investigate large Projects from the managerial point of view paying strong attention to the aspect of supporting high development quality with stable non-increasing investments into the Project. The ultimate goal is to clarify possible directions for strengthening of th eProject management and give some hints for practitioners and Senior Management of companies how to manage large Projects with essential part of software development and avoid unacceptable situations during development process.

Design/methodology/approaches – practical experience in the software development management in banking during twenty years and the literature review.

Findings – This article collects the long-year experience and practical results in the software development governance and management, especially working with external software outsourcers and provides some useful hints for practical Project Managers. The author identifies the most critical stages of Project and proposes the direction for solving them.

Practical implications – The research could impact behaviour of the Project Managers leading the large Projects to pay more attention to particular stages of software development. As a result more Projects could be finished and launched successfully in time and with higher quality. In this case company could get better economic results related to its' financial investments and expenses in the IT part and, as a result, to be more effective in the market. The author believes the conclusions of investigation could supply also social benefits like better understanding between local and outsourced software developers.

Value – This paper provides value for practitioners dealing with the large Projects for the new software implementation and facing some problems during the process.

Keywords: Information technology, Information System, Project management, Software development, Development Outsourcing, Business Requirements analysis, Test process.

1. INTRODUCTION AND TOPICALITY OF THE RESEARCH

Nowadays evolution of Information Technology (IT) and development of software applications increases rapidly practically in all developed countries and markets. Software application development takes huge part of common time and investments consuming in various areas of economics, business, finances and others. A large number of new Information systems (IS) implemented in finance area are standard from-the-shelf applications made by large external IT companies and adapted according to local business needs. In most cases investigation of business area and local functional requirements; standard IS selection, adjustment, customization and further implementation is organized as Large Business or IT Project with Project's budget, schedule and resources assigned. In general, each essential Project has large part of Information Technology tasks, usual these tasks have very high priority and strong request from Top Management for the

appropriate Project launching according to initial schedule, with perfect software quality, but having restricted human labour resources.

Aim of the research. The aim of the given research is to reveal the most critical success factors for the Project that has essential part of software applications development process. In this case study the author define the most critical issues of such Projects from software development point of view so the managers and responsible persons could pay more and deeply attention to this particular area of managerial concerns.

Definitions. Some authors define Outsourcing like as a regulated entity's use of a third party (either an affiliated entity within a corporate group or an entity that is external to the corporate group) to perform activities on a continuing basis that would normally be undertaken by the regulated entity, now or in the future (Bazel Committee, 2005). When considering outsourcing as particular deeply specialised activity in IT area, some authors define it as part of Global Software Work done across global borders as software work undertaken at geographically separated locations (Sundeep Sahay, 2003).

Restrictions. The investigation in the case study below touches, mainly, one aspect in the whole set of managerial problems of large Projects governance, namely the adaptation of Standard IT solution according to particular business requirements, that in most cases, is done, fully or partially, by external IT developers – outsourcers. In this case management of the Project could faces with even more complicated issues and managerial implications comparing with development by the own company's IT developers. The author is deliberately distancing from other various essential management issues and problems in the Projects which usually appear in any large Project.

The beginning of the research was in 2000, when the author was engaged in investigation of possible approaches for software development work management and tried find out the most appropriate model for this activity in one of the Latvian banks.

As a base for the investigation of software outsourcing and its' managerial implications four Large Projects were taken being implemented in the bank during years 2000 – 2010.

Research methods. Literature review, practical experience on management of software development in Large Projects, analysis and interpretation of factual data about software development tasks within all development Phases.

The given research could be topical: (1) for Project Integrators and Project Managers whose responsibility is to ensure successful implementation of large standard Information System customized according to local requirements; integration of different components of the Project; cooperation and coordination between several development teams and compliance with agreed schedule of the Project; (2) for Project Sponsors, Top Management of the company, Project Managers who are responsible for company financial results and effective IT investments policy; (3) for Software Architects whose responsibility is to ensure proper software architecture and interfaces.

2. SOFTWARE DEVELOPMENT OUTSOURCING

Why finance companies decide to chose standard IS; adapt and customize it accordingly local business needs instead of developing the own unique Information System? Why software development outsourcing to external IT provider becomes more and more popular? The last data testify that the majority of systems and applications used in finance and banking industry are standard from-the-shelf applications with world known and approved functionality. In these cases banks should localize standard IS to be able operate in compliance with local requirements of the country and internal business needs. The adaptation and customization of IS as a rule is fully or partially given to outsourcers or freelancer software developers.

In general, the reasons for standard IS selecting and software development outsourcing from management point of view are the following: 1) the strong agreement for standard IS purchasing and further customization between Customer and external IT company ensures Senior Management about good quality of the product and timely Project results 2) shortage of own IT resources restricts developing of self-made IS 3) trust to professionals in external IT company reinforces managerial expectations for successful Project progress and launch 4) deteriorate and reduce the risk of being highly dependent on the own IT resources.

The authors experience during last fifteen years in Latvian banking industry, some case studies in Russian banks and detailed analysis of numerous cases for various IS procurement gives the evidence that in the most cases when new large functionality is needed, preferable solution could be IS purchasing from external provider and further adaptation of system according to local business.

Project Critical development stages in situations which require adaptation of standard software. Regardless of whether the software is developed for new business application or for Standard IS adaptation it is vitally necessary to have the clear understanding of the most important Project components, namely, (1) phase; (2) milestone; (3) role; (4) task and work product.

Project Phases. As a rule, all Project' activities are grouped into Project Phases giving Project Manager and Team the possibility for detailed planning, assigning and managing human and other resources involved in the Project during each Phase. Defining clear set of tasks for every Phase, Top Management and Project Sponsors get effective measurement mechanism for observing and estimation of Project achievements.

In general, the most authors agree that classical and powerful approach for sophisticated software product development supposes the existence of the following Phases peculiar for each Project. These Phases are the following:

1) Business Requirements and Modelling;
2) Requirements Specification;
3) Analysis and Design, Functional Specification;
4) Software Development (Implementation);
5) Configuration and Change Control Management;
6) Test (including User Acceptance Test);
7) Deployment;
8) Transition;
9) Post Implementation Support.

Project Management job, being relevant for the whole Project, lasts all over the Project time and during all Phases being one of key success factor for effective management. Usually as pure development Phases could be considered Phases from 1) to 7), leaving Phase 8) and Phase 9) for IT system maintenance after new adapted IT system is launched.

Milestones. Classic definition of Project Milestone, used in Rational Unified Process is like "Each phase is concluded with a well-defined *milestone*—a point in time at which certain critical decisions must be made and therefore key goals must have been achieved (Rational Software White Paper). Author do believes that in case of large Project, when every Project Phase consists of numerous various activities, several Milestones have to be set for each Phase instead of setting only one main Milestone for Phase. Practical experience and cases that was investigated, testifies that in reality it is extremely better to set detailed precise milestones for the whole duration of the Project, precisely defining the time schedules, deliverables, responsibilities, and other possible indicators for Project progress. Discussing about defining and setting of Milestones in the Project, Steering Committee and Project Manager should define the Main Milestones with clearly and distinctly determined tasks, responsibility for every participant, achievement and deliverables that have to be completed before the next set of tasks.

Roles. It seems obviously that defining Roles in every Project does not depend on the extent to which external human recourses are involved. From managerial perspective the same classical Roles for any Project should be defined, however in condition when company cooperates with outsourcer for standard IS customization, the meaning and weight for some particular Roles in the Project increases dramatically. In further analysis these Critical Roles for Project members will be nominated.

Tasks and Work products. Important factor for successful Projects is clarity of tasks and work products, in most cases there is a specific set of tasks for each Milestone and each Team member. Generally speaking, the issue of determining set of Tasks and Work Products does not seem significant question of concern from Managerial point of view, being closely depending to company and Project specifics.

But which Project Component becomes more critical in case when we need to adopt standard IS for local business with IT outsourcers' hands?

Over the years author has participated in a wide range of projects for various IT solutions development and fully agree with leading IT managers and developers' point of view about existence of set of risks which could occur in every Project with high probability level and are common for all software development Projects. Tom DeMarco and Timothy Lister both believe that the most essential and, unfortunately, the most common Risk, which could be estimated as the very first Risk, is the Risk of inadequate plan for investment and time budget and schedule for particular Project (Tom DeMarko, Timothy Lister, 2005). Other scientists and practitioners reasonably suppose that one of key success factors for software development in agreed schedule is proper estimation of forecasted human resource consuming. "Improving estimation techniques so that sophisticated organizations can achieve project results within +-5% of estimated results instead of +-10%" (Steve McConnell, 2006).

Author's long-years experience in a wide range of projects for various IT solutions development allows him to define two Project components that should have the ultimate manager attention, namely, the particular Phases of Project and particular Roles, being extremely critical for effective progress of the whole Project in case of Standard Information System adaptation for local business needs.

Critical Phases. As a rule, Project Phase "Software Development (Implementation)" with a lot of numerous software development tasks, is usually considered as the most essential and highly labour-intensive part of each software development Project. Management and Stakeholders of every Project generally are extremely concerned about duration of these tasks, and length of time actually spent namely for software development. Taking into account normally existing high shortage with software developers, Top Management tries to keep track of actual time, budget figures, and human (labour) resources consumption exactly during Phase Software Development. In most cases Software Development tasks and time-efforts forecast could be estimated with very high probability. Nowadays there are a lot of approaches, methods, techniques and procedures that could be applicable for software development estimation. Depending of Project and tasks size, software development method, forecast accuracy needed, as well as depending of database management system, programming tools, developer skills and experience and other relevant factors, the variety of estimation methods could be applied. As a result, precise enough estimation for every piece of developed software could be accessible in the very early stage of development, giving Top management solid base for proper tasks scheduling and governance of the Project.

In addition, in case when Ready from-the-shelf Standard IS should be adapted to the local business needs, the volume of software development might be essentially less than in case new software application is developed. In this situation main managerial focus and emphasis should be put on the other Project Phases.

Phases of Business Requirements and Modelling, Requirements Specification, Analysis and Design. The Phases of Managing Business Requirements, starting from identifying the area what should be customizes according to local legislation and customers habits and finishing with strong detailed specifications of needed adjustments together with interfaces for interaction with other IT systems, becomes key success factor for every Project. The art to identify, clarify and conclude business requirements, but, the most important, to elicit and extract required functionality, restrictions and constraints, capture, communicate and specify them in written way sometimes seems practically unachievable goal.

3. RESULTS AND DISCUSSION

Over the years the author had participated and managed numerous Projects of Standard IS customization for various business issues in finance area, he gained a lot of practical results and outcomes with these kinds of Projects. Four large Projects were studied as Case studies for this research. All suitable Legal Agreement with vendors, Project documentation, deliverables and Project progress were analyzed and investigated at each Project.

The author's practical experience testifies that ultimate managerial attention should be paid to the Project Phases which are in the very beginning and in the very end. As it is mentioned above, the most critical task and the first milestone of each Project is understanding and defining of business functions and specific local needs that have to be built-in Standard IS. The most critical time for any Project, hence, will be the period when business requirements are defined and communicated to developers. The second serious milestone for Standard IS adaptation will be Testing Phase and especially, User Acceptance Test as the main instrument for software quality assurance from customer point of view.

These two essential milestones – Managing of Business Requirements and User Acceptance Test could affect dramatically Project schedule, budget and time. The impact of the abovementioned Phases to software quality in most cases is underestimated when in reality imprecise set of business requirements and careless testing process could potentially even disrupt the whole Project. The consequences of errors and inaccuracies in these Phases are more seriously for the progress of the Project comparing with any other time period.

In addition, high probability that the risks will occur and potential impact significantly grows in case when Project is realized with high part of external IT Suppliers Company as outsourcing developers. Usually area of business requirements is considered as pure business prerogative and Top Management do not realize the necessity and high added value of involving IT system analyst and IT architect in this step. Author do believes that composing effective analysts' team with participants' roles as "Business analyst" together with "Requirements Specifier", "System Analyst" and "System Architect" from IT in the very earliest phase of the Project could considerably contribute to the successful launch of customized Standard IS.

The research goal was to investigate the extent to which local IT analysts and developer's involvement in common Project with external IT developers affect the success of the Project.

This article analysed the following data:

1) Four large Projects for Standard IS adaption according to Latvian legislation requirements and local business needs;

2) All software development tasks in each Project were included in the Common Project Schedule, the major tasks of which were dependent significant progress of the Project, were defined as Milestones;

3) Each development task was formalised and executed as particular Change Request (CHR), with appropriate set of business requirements;

4) Each CHR passed all abovementioned development Phases;

5) To have comparable data from all analysed Projects, 50 CHR were selected from each Project. Selection criteria was consumed efforts in mandays for software development in particular CHR, these efforts should be in the interval 15-20 mandays. Author believes that using this criterion it was possible having set of similar comparable CHR. As a result data set for investigation was composed of 200 CHR;

6) Totally consumed efforts in each CHR for all development stages was from 45 to 60 mandays.

The analysis of CHR from the selected set shows the following results.

1. 23% from all CHR were developed by external developers without any support and cooperation from local IT (Group A); 34% from all CHR were developed by external developers with cooperation from local IT up to 10% of common mandays (Group B); 43% from all CHR were developed by external developers with cooperation from local IT up to 20% of common mandays (Group C). See Figure 1.

2. Each subset (Group A,B,C) were investigated separately, in order to clarify whether external IT developers cooperation with local IT system analysts could impact developed software quality.

The number of User Acceptance Test (UAT) iterations for each particular CHR is recorded.

3. The results show essential difference in these three Groups.

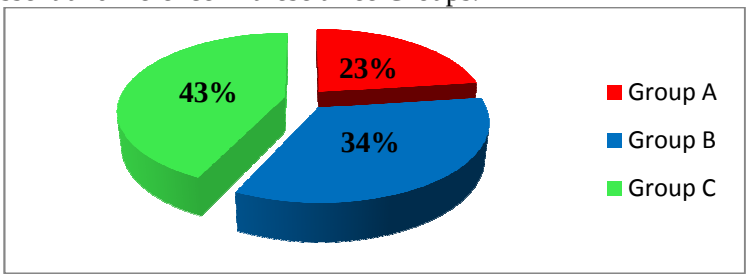
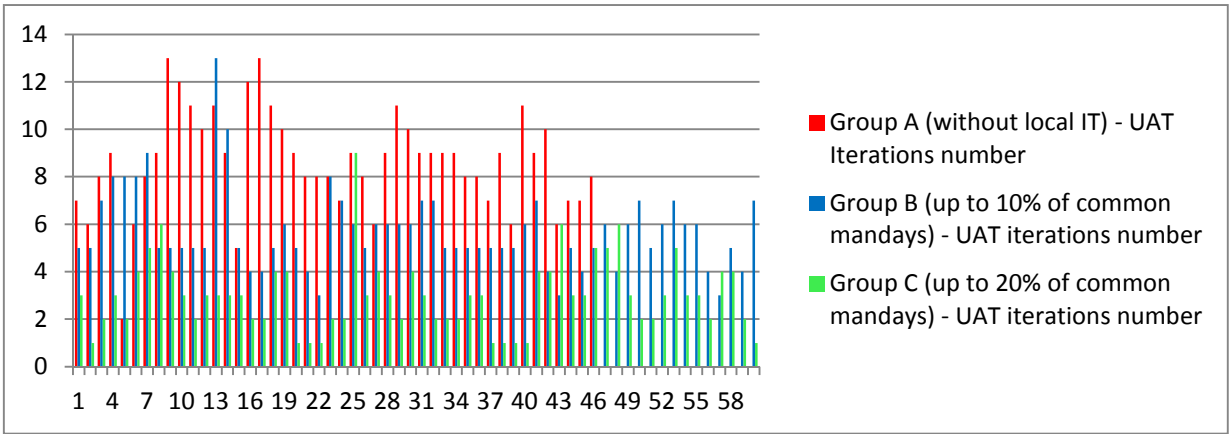


Figure 1. The distribution of Change Requests by local IT developers involvement degree.

Namely, the worst figures and the biggest number of UAT iteration times are the Group A, where outsourcers were left alone while developing tasks for software adaptation. We see significantly better results for Group B, where local IT developers supported external IT staff and were working together. But the best picture is definitely for Group C, in which local system analysts-developers' contribution in the whole development was up to 20% from common consumed efforts. The number of Test iteration times in Group C decreased dramatically, and duration of software development remained shorter, that means that involvement of local IT had contributed a lot to common Project schedule. See Figure 2.



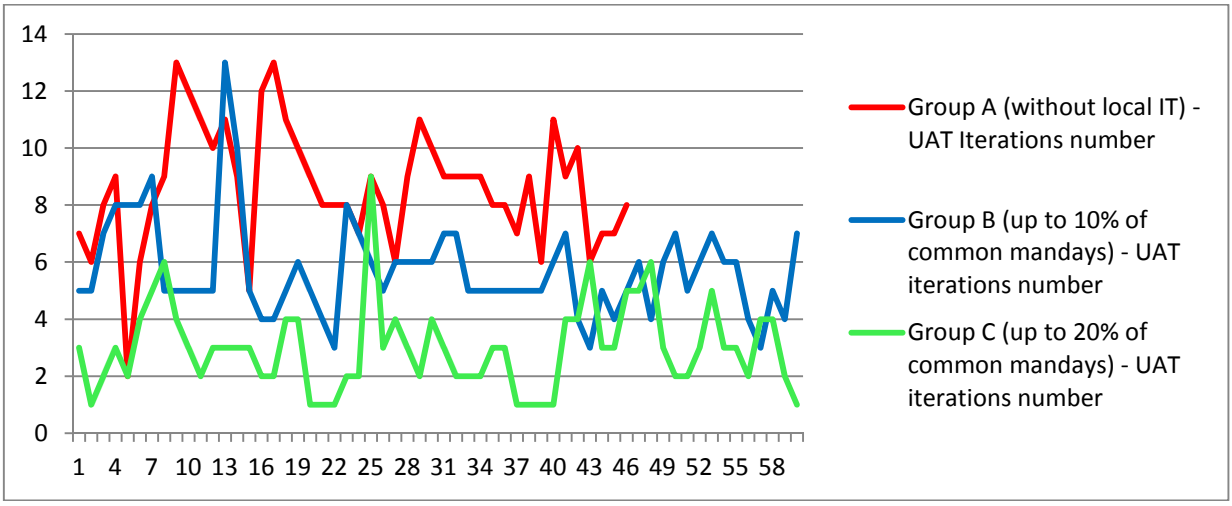


Figure 2. Number of UAT by Change Request Groups

But why involvement of the local IT analysts and developers in different Projects of the Standard IT system adaptation and customization according to the local business requirements in the very early stage of development could essentially influence the process and dimish the number of UAT thus affecting: 1) the common duration of the Project; 2) the quality of adapted software functionality; 3) the initial budget figures of the Project?

In addition, cooperation between local and external IT analysts and developers in the investigated Projects was organized in the earliest Phases of development, namely, during Modelling of local Business Requirements, Analysis and Design, Functional Specification preparation.

The author thinks that the local IT analysts are able to essentially improve the external analysts' understanding of the required business adjustments having comprehensive knowledge of the local business processes and operations.

4. CONCLUSION

We could define the key success factors that allow the local IT analysts to be more competent in the business issues as compared to the external consultants.

1. Usually the external staff has restricted knowledge and understanding about specific area and local business conditions and features. As a result in main cases the necessity for precise and detailed description of requirements increases several times. Representatives from Business have to define extremely detailed requirements in written way, fully describing every parameter for each Unit, for each Product, each Business Process and Business Case. Otherwise it is possible wide self-interpretation of requirements that could lead to misunderstanding and cause totally wrong solutions.

2. Widely known, that sometimes there is deep distinction of business products, processes and technologies in the western and eastern finance markets. As a result, we could expect high probability that some business product or process will be reflected and adjusted in incorrect way. The development of some banking products, financial models and instruments should vary for different markets, for instance, in some eastern countries nobody of customers is allowed to get profit from bank deposit when in western banks this is common occurrence. Only local business and IT system analytics could be deeply familiar with specifics of the local market.

3. The most challenging points of software architecture are the sections at which different functionality interact. That is where errors are more likely to happen. External developer never knows environmental conditions, Information Systems already existing in organization, their interaction and interfaces and, as a result, is not able investigate the interactions between IS and make proper decision for data exchange.

In these conditions the significance of Software Architect Role rises dramatically, being very important as for external team as well as for local developers' team. They should work together having overall responsibility for the solution.

4. Business persons communicating with external developers need good communicational skills, both in terms of being able to express themselves verbally and in writing. Significant knowledge of the business and

the problem domain is also required as well as the knowledge of how to describe a use case in detail. Business analyst generally in most cases has deep knowledge in particular area, is familiar with country local legislation and legal requirements, in some extent knows industry trend and could forecast further needs. On the other hand the vast majority of business analysts have no experience of interacting with outsourcers therefore common work in international team is considerable restricted and simplified.

5. For getting overall responsibility for proper and adequate Project results it seems very effectively to assign the Role of Test Manager for each particular Project. The Role of Test Manager involves software quality assurance and test advocacy, test resource planning and management, ascertaining that the apportionment of test coverage between business and IT analytics is optimised to avoid gaps as well as redundant overlapping. Depending on the Project size, Test Manager should ensure functions of proper accurate software testing either assigning particular persons Test Designer Role and Test Analyst Role or doing these functions by himself.

6. Investigating software development process done by internal company developers and external providers, we see clear differences in mentality, work habits, office culture and in psychological perception factors. These issues should not be underestimated and in some cases could seriously affect process complexity and influence the overall performance of common job doing.

Within the analysis of management strategy and managerial implications to the Standard IS adaptation for local country, the author made the following conclusions.

1) The result of the research gives clear evidence that it is extremely important to ensure the cooperation of local and external IT system analysts in the earliest Phases of software development for achieving better outcomes for Project. Misunderstanding of business needs during the Phases of Managing Functional Requirements definitely costs a lot of wasted resources and further efforts consumed for wrong solution.

2) Assigning the Role of Software Architect to highly professional competent players from both developers' teams can provide the development of proper and effective solution for Standard IS adaptation.

3) Educated, skilled and highly professional Test Manager should be assigned for proper software quality assurance in every Large Project.

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