Software for improving the quality of project management, a case study: international manufacture of electrical equipment

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Abstract. Production conditions in today’s world require software support at every stage of production and development of new products, for quality assurance and compliance with ISO standards. In addition to ISO standards such as usual metrics of quality, companies today are focused on other optional standards, such as CMMI (Capability Maturity Model Integrated) or prescribing they own standards. However, while there is intensive progress being made in the PM (project management), there is still a significant number of projects, at the global level, that are failures. These have failed to achieve their goals, within budget or timeframe. This paper focuses on checking the role of software tools through the rate of success in projects implemented in the case of internationally manufactured electrical equipment. The results of this research show the level of contribution of the project management software used to manage and develop new products to improve PM processes and PM functions, and how selection of the software tools affects the quality of PM processes and successfully completed projects.

1. Introduction

Now days in the era of information technology (IT) it's never be easier to find information, knowledge and example of good practices in area of project management. Volume of useful and available information is enormous. In spite of all this, there is still a worrying amount of failed projects on a global level. Companies which efforts focus on project management (PM) spending 13 times less money for reaching the business goals, because developing of different PM structure is result of better selection and alignment of projects with long period strategy [1]. The practice recognizes relevance of PM in business but this fact is still not fully adopted.

Research problem in this paper is about large number of failed projects that are not implemented on time, in defining budget and not meeting foreseen purposes. Reports on global level show increase of numbers of unsuccessful projects and costs that are connected with projects. These have failed to achieve their goals, within budget or timeframe. This paper focuses on checking the role of software tools through the rate of success in projects implemented in the case of internationally manufactured electrical equipment.

First secondary hypothesis is that properly selected projects that are in harmony with strategic goals of company contribute decrease of costs and growth of performance (meet goals, finished on time and in budget frame).
Second secondary hypothesis is that use of advanced software has direct impact on increase the number of successfully finished projects.

Main hypothesis is that advanced software tools have impact on increase of maturity level of PM process.

First part of the paper is about global trends in PM and situation about status of realized project for the last 4-5 years on global level during the few most important parameters. The rest of research is case study in manufacture of international company from electrical area about maturity level of PM process for developing and introduction of a new products in the production line. At the end are conclusions and recommendation for future researching.

2. Global trends
This part of paper shows situation on global level about projects success status, impact factors on success, risks etc. Also, here is part of report about CMMI level of assessment on global level. It shows how much more must be done in area of project management and moving up maturity level of organizations in today’s world.

2.1. Projects success status
Balance sheet of status of realization project on global level is not promising for last few years. According to the Standish Group Report (figure 1) status of realization 50.000 IT project shows that only 27-31% of all projects finishes successfully [2]. And in average, more then 50% of all started projects finished, but with transgress of time, budget and purpose.

![Figure 1. Realization status of 50.000 IT project (2011-2015)](image)

Trend of increase of failed or transgress project is continued from 2013 to 2015 in IT projects. The main identified reasons for this situation are lack of established prioritization process and mismatching of project to long term strategy. According to [3] it is very often situation in which company starts with a project only because project looks like good and popular. Around 68% of companies don't have
defined project prioritization process. Purpose of this process is prioritization and creation of list for rank of projects. Only 12.5% of companies take care about align project with long term strategy.

The projects on Figure 1 are different size, scope and complexity. The dominant parts of successfully projects are small projects (62% of all successfully projects). Also, developing methods shows different results – agile methods have significantly more success instead of waterfall method. With increase of scope and complexity goes higher risk of failing.

Positive impact factors on success of projects including PM experts (5%), clear business goals (4%), strong management support (15%), relations between team members (15%), involved users (15%), optimization of results (15%), educated team members (10%), agile skills (7%), resource economy (6%) and software, tools, practices and services (8%) [2].

Also [1] PMI identified 3 positive and 3 negative impact factor success of project:
1) Meet the business goals
2) Project is finished in defined time frame
3) Project is finished in defined budget frame
4) Scope creep – is lack of focus, conditions or purpose. It is about uncontrolled adding of annex or no planned tasks in project.
5) Costs because of surpassing budget frame.
6) Projects that failed before the start – the team or other employers think project is failed before it starts.

All these parameters in last year show undesirable performance. The positive parameters (1, 2 and 3) were moving down, and negative parameters moving up (4, 5 and 6). Analyses of global trends tells that 3 positive parameters move down for last 3 years (2014, 2015, 2016): percent projects that meet goals are 64%, 64% and 62% (respectively), finished on time are 55%, 55% and 53% and finished in budget frame 51%, 50% and 49%. Opposite to this, there are 3 negatives impacts on project success and all of them grow up: scope creep (43, 44 and 45%), costs of surpassing budget frame (30, 30 and 32%) and projects that failed before the start (16, 15 and 16%) [1].

Some of identified causes of failure, according to PMI are:

- Organization priorities in project are changed (41%),
- Projects goals are changed (38%),
- Inadequate set project’s goals (37%),
- Chances and risks were not examined enough (31%),
- Inadequate purposes and goals of project (31%).

2.2. CMMI assessment status

According to reports [4], during the last 9 years amount of CMM certified organizations in world is 13.719 in 98 countries. Structure of this amount per maturity level is:

- Initial level organizations (1%),
- Repeating process level (19%),
- Defined process (70%),
- Managed process level (2%) and
- Optimizing process level (8%).

Bosnia and Herzegovina, Serbia, Slovenia, Monte Negro, Albania, Moldova and Estonia are the only countries in Europe that don’t require for CMM assessment. The closest CMMI center is in Bulgaria. Spain have the highest number of assessments in Europe. On the global level the highest number of assessments has China, USA and India.
Table 1. Tools for moving up organizations maturity level [5]

| Number | Tool name                                      | Vendor                  | Web address                          |
|--------|-----------------------------------------------|-------------------------|--------------------------------------|
| 1      | Automated Test Designer (ATD)                  | AtYourSide Consulting   | http://atyoursideconsulting.com/     |
| 2      | Callis Guide; Callis Reviewer                 | Callis                  | http://www.callis.dk/                |
| 3      | Више софтверских решений (multi-software)    | SE-CURE AG              | http://www.se-cure.ch/               |
| 4      | DataDrill 5.0                                 | Distributive Management | http://distributive.com/             |
| 5      | Polarion QA, Polarion Requirements (LESAT)    | Siemens                 | https://polarion.plm.automation.siemens.com/ |
| 6      | Lean Enterprise Self-Assessment Tool (LESAT)  | MIT                     | https://dspace.mit.edu               |
| 7      | Adobe Analytics Capability-Maturity Assessment Tool* | Adobe               | http://adobemarketingpro.com/        |
| 8      | Knowledge Management Capability Assessment Tool (KM CAT) | APQC          | https://www.apqc.org                 |

*Tool is used only for moving up marketing function processes or marketing sector maturity level.

The frequent needs of assessment goes to telecommunications, security, safety and recover data, army, defense, government, finance, bank and assurance company. Analyze indicates that the most frequent request for assessment comes from Asia (57%), North America (26%), Europe (10%), South America (6%), Africa (0,97%) and Australia (0,30%).

Software tools for moving up maturity level of organizations and its parts are detailed instructed. We can find only few of them (Table 1).

3. Case study – international manufacturing company
Research of this case study was made in global known company (in Balkan they have factories in Serbia, Romania, Austria, Switzerland and Italy). The study was conducted from 10th to 15th October 2016 in Romania. The company is producing diverse equipment for industrials needs. We have examined two parts of maturity project management processes which develops and introduces new products – first one is about the process used in PM and another one is software for moving up maturity level of PM process.

3.1. Project management process in company
Project management process (PMP) of introducing the new products is completely standardized and structured. PMP have:

- Phases – are sets of standardized activities that team implements in company. PMP have 7 different phases that every project goes thru. At the end of every phase is checkpoint.
- Checkpoints – places for quality control and making decision for status of project. Purposes of checkpoints are support good business ideas and projects, and stopping the nonprofit ideas. Decision are made in accordance to risk assessment, reports and check lists.
Result of every checkpoint is status of a project (go to the next phase; conditionally transfer to another phase; repeat some of the parts of the same phase and go again to the checkpoint; temporary stopping of the project; stopping the project). At every checkpoint team must check if project is still aligned with long term strategy of the company.

PMP are: 1) Selection of the projects. Here is necessary to make risk assessment document and strategy aligned documentation. 2) Concept activities are in the second phase and these are solutions for production, market research and earnings possibility. 3) Third phase is about the project goals and tasks for establishing contact with suppliers. Design process is in progress and starts with products introduction at the market. 4) Design and development phase is the plan for optimization the production process and capital costs for project. 5) Validation is the next phase. In this part there is a small test limited edition test product production. This test product will end up on the market for clients test needs, design test and suppliers authorization. 6) Starting with the production. 7) Closing the project.

Quality control is implemented on every checkpoint, after every phase. The most common question raised are: all activities from last phase done? The priority of the project is synchronized with the global portfolio of projects in company. Performed risk assessment, aligned with the project in long term strategy.

3.2. Company software tools for moving up maturity project management level

In this specific company is used Microsoft Project for managing all PMP development and introduction of the new products. All activities and documentation are conducted in Excel Template. Share Point platform ware used for collaboration and access to company documents.

Also, Excel predefined templates are used in every phase of PMP. There is a variety templates that created internally and are the same for every project. Team for quality controls on checkpoints used Share Point platform to access predefined Excel templates and making decision. Besides mentioned software tools, company also uses One Spice design 3D software for designing every new product. Data base of all sample designs is developed and implemented internally for company needs.

Integrated Quality Management System is integrated software for managing and analyzing information in projects. Vendor is Siemens. This solution can be integrated with in information system of the company no matter on size, and also can be customized to the company’s needs. QSYS supports periodical inspections – this specific company used this.

In phases 5 and 6 for every product SAP Production Planning module is using assignment code for every product. But, after the introducing the product starting with full production SAP PP module will take the dominant role in production process. Code for every product will contain the part of code of sample design in drawing data base, and also and some other information (production date, where made, from what material, supplier, etc.).

4. Conclusion

Even with a lot of knowledge, best practices and education, there is still a tendency of failed projects on global level. According to data in this research, on every billion of dollars is 122 millions US cost (lost) because of the poor project management (some about 12% lost). This company did not have this kind of issue. From 2009 (after start with EPMO and project management formula which is completely standardized in all processes) to October 2016 company implemented 10 projects and all of them was completely successful. Key of success is in optimal and careful combination of simple software tools (like MS Project, MS Excel, Share Point) and advanced software tools (like QSYS and SAP) with standardized process during the PMP.

First secondary hypothesis - properly selected projects that are in the harmony with strategic goals of company contributes decrease of costs and performances growth (meet goals, finished on time and in budget frame) is confirmed. Before the selection process started team works on preparation of documentation, risk assessment, capital costs, purpose and alignment of the project with the company
portfolio. Also, on every checkpoint alignment with the project portfolio must be checked (long term strategy).

Second secondary hypothesis that use of advanced software has a direct impact on increasement the number of successfully finished projects – is not confirmed. This processes are important more then advanced and expensive software, but combination of advanced software tools with standardized process and simple tools provide the best optimal result.

Main hypothesis confirmed that advanced software tools have impact on increase maturity level of PM process. Therefore, only advanced software tools do not increase maturity level of PM. There must be a standardization, defined processes and carefully combination of software. This would be the key of success.

Future recommendations for researching propose direct comparison software tools for moving up company maturity level and introduction and education of CMMI verification process and his significance in business. On Balkan there is no CMMI center for verification of organization maturity level and there is a need to increase information about its role for global businesses.

References

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