ENVIRONMENTAL GEOLOGY PROJECTS SUCCESS IMPROVEMENT

Markéta LAJCZYKOVÁ
VŠB-Technical University of Ostrava, ltd. 17. listopadu 15/2172, 708 33 Ostrava – Poruba, Czech Republic
marketa.lajczykova@csuostrava.eu

Kristína ZGODAVOVÁ
Technical Univeristy of Košice, Letna 9, 040 01 Košice, Slovak Republic
kristina.zgodavova@tuke.sk

Abstract
The purpose of the paper is to present the possibility of improving the processes and work results of project organisations providing services in the field of environmental geology using the original model EGEOS-PSI, which uses indicators of quality and economic efficiency for situation awareness before planning, during, and after the implementation of projects. The starting point of the research are real findings in "case" organisation. Research methodology is based on an analysis of existing projects in the organisation that provides services in the field of environmental geology with the aid of case studies. From which, a universal model was prepared to further research this issue. The originality of the research is both to develop Barkley´s & Saylor´s method, "Customer Driven Project Management" (CDPM) of selected tools and methods used in quality engineering and quality management (e.g. CEDAC, etc.) and to define the specific characteristics of services using the Kano model. Certain research limitations where both the ability to anticipate risks, and the possibility of suitable involvement of a customer, within the project team.
Keywords: Environmental geology, Project Success Improvment (PSI), Customer Driven Project Management (CDPM), quality tools.

1. INTRODUCTION

"Let your customer create your success" – Barkley & Saylor

It is known that the project managers face various problems in each project. Generally these problems are with time, finances and quality. The main task of the project manager is to identify problems before they affect the project results and know how to deal with them should they happen.

Classification of projects that fall outside the scope of research and development according to (Frascati, 2002) and (Reynolds, 2012) are as follows:

- Civil Engineering, Construction, Petrochemical, Mining and Quarrying Projects;
- Manufacturing Projects;
- Management Projects.

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Projects of the first and second type leave larger or smaller environmental loads and then management projects often have to deal with them.

In the context of "sustainable thinking" the European Commission has proposed a new Environment Action Programme for the EU, entitled "Living well, within the limits of our planet". This, supposedly, will guide policy environment up to 2020 (Potocnik, 2012). This proposal aims to enhance Europe's ecological resilience and transform the EU into an inclusive and sustainable green economy. The concepts of environmental and social aspects of sustainability, energy challenge, and social responsibility are very important for our future (Frost, 2012). It follows that the role of organisations involved in projects related to geological loads will grow in the future significantly.

The starting points for this paper are the specific findings in the "case" organisation which are mostly related to ambiguity of information and complexity of change management in projects.

The purpose of the paper is to present the possibility of improving the processes and workresults of project organisations providing services in the field of geology, but the results are universally applicable and can be applied to similar organisations that use project management principles to manage their complicated contracts.

The methodological basis for the paper is both the Customer Driven Project Management (CDPM) (Barkley & Saylor, 2001) method and the tools and methods used in quality engineering and quality management, which are applied to projects related to geological services.

Barkley and Saylor (2001) noted that project quality management “is the process of integrating and managing quality into the core project management process rather than using quality tools simply to inspect and appraise the work after the fact.“

2. METHODOLOGY

Research methodology is based on an analysis of existing projects in the organisation providing services in the field of environmental geology with the aid of case studies, from which, a universal model was prepared for further research this issue. Case studies relate to contracts in the field of geological services, specifically, in its Environmental Geology Division (EGD). During 2010 – 2012, major projects aimed at solving past environmental burdens were monitored. Geology is the essential part of this project. In 2010, further research developed the united algorithm for the situations awareness and improvement of projects success (S) modified by (Zgodavová & Slimák, 2011) and thus improved the Quality (Q), Effectiveness (E), Efficiency (I) and traceability (T). This step was based on the review of

project documentation and subsequent processing of the case studies. Defining project success is often associated with: “deliver outcomes on time and on budget“ . But are those really the success factors that are most important to the customer in the case of environmental projects? Delivering a successful environmental project starts with taking a step back and understanding business drivers of the organisation and environmental impacts to the society.

In the case of projects, it is more suitable to replace the term Key Performance Indicators (KPIs) according to ISO 9004:2009 with the term Key Success Indicators (KSI) as a common term for criteria used to measure the benefits (financial and non-financial) of a project. "The KSIs are the reason that the project was launched" (Suchan, 2003). For the purpose of this research, we have introduced the term Key Customer Success Indicators (KCSIs) because their aspects are generally the same. Direct application of the model and ongoing projects evaluation using model Environmental Geology Service – Project Success Improvement (EGEOS-PSI) took place durings 2011 - 2012. At present (February 2013) finalised universally applicable results are based on the validation of real achieved results.

Research into projects in the field of environmental geology is a complex system as there are multiple, simultaneously running processes, often bringing unexpected negative surprises.

The originality of the research is to combine the Barkley´s & Saylor´s methodology Customer Driven Project Management (CDPM) with the specific tools and methods used in quality engineering and quality management, which does not contain the original CDPM methodology. Core of developing CDPM was consistent KPSIs application and evaluation of the quality and efficiency of the processes and project´s results using the decision-making tool CEDAC (Fucuda, 1989). That was used by integrator for CDPM and QEM other tolls; and specification of services in the field of environmental geology using KANO (Robinson, 2009). It was in the first year of direct application (2011). Individual steps of EGEOS PSI model are shown in Table 1. A large number of tools, methods and recommendations on how to deal with various cases, challenges and problems with the quality, performance and economic efficiency of organisations we can find in the literature related to project management, quality engineering and quality management (Plura, 2001), (Zgodavova. et all 2002). E.g. the full "Mind Tools" toolkit contains more than 700 management, career and thinking tools and skills (Mind Tools, 2013). The toolkit is divided into 12 areas, which include project management with over 50 single skills and tools. The choice of the most appropriate tool is the role of project manager in a project team (project team leader). The knowledge and application of tools and techniques of project management, quality engineering and quality management is standard practice in our "case"

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organisation. We choose the tools and methods that can help improve situations where problems may occur.

TABLE 1 - EGEOS-PSI PROCEDURE EXTENDED OF CDPM METHOD.

PHASES	CDPM	VOICE OF CUSTOMER INTEGRATION	QEM TOOLS
THE PREPARATION OF THE PROJECT IMPLEMENTATION	**1) EGEOS-PSI** 1. CDPM: DEFINE QUALITY ISSUES	1. CEDAC*: IDENTIFY THE PROBLEM	1. QEM: ESTABLISH CUSTOMER DRIVEN PROJECT TEAM (CDPT) ACCORDING TO THE METHOD (BARKLEY & SAYLOR, 2001)
	2) EGEOS-PSI 2. CDPM: UNDERSTAND AND DEFINE THE MAIN PROCESS OF THE PROJECT		2. QEM: SIPOC** 3. QEM: SELECTING PROJECT PROCESS METRICS
	3) EGEOS-PSI 3. CDPM: SELECT IMPROVEMENT OPPORTUNITIES	2. CEDAC: WORK OUT THE MAJOR FACTORS INVOLVED 5M + F + T + S + C + E	4. QEM: FACTOR ANALYSIS 5. QEM: BALANCED KPSIS WITH CEI
PROJECT IMPLEMENTATION	**4) EGEOS-PSI:** 4. CDPM: ANALYSE IMPROVEMENT OPPORTUNITIES		6. QEM: VALUE STREAM MAPPING (VSM) 7. QEM: FLOWCHART 8. QEM: KANO MODEL*** 9. QEM: PRIORITISATION
	5) EGEOS-PSI: 5. CDPM: TAKE ACTION	3. CEDAC: IDENTIFY POSSIBLE CAUSES TO COMPARE THE VALUE OF PT AND PR FOR THE CRITERIA 5M + F + T + S + C + E	10. QEM: ANOVA – VARIABILITY DETERMINATION 11. QEM: BENCHMARKING; DATABASE
PROJECT'S RESULTS PROVIDING	**6) EGEOS-PSI:** 6. CDPM: CHECK RESULTS	4. CEDAC ANALYSE DIAGRAM AND ADDITONAL CARDS	12. QEM: CONTROL PLAN 13. QEM: KANBAN CARDS
	7) EGEOS-PSI: 7. CDPM IMPLEMENT IMPROVEMENTS		14. QEM: KAIZEN BURSTS 15. QEM: IMPROVEMENT CARDS WITH THREE DOT SYSTEM
	8) EGEOS-PSI: 8. CDPM: MONITOR RESULTS		16. QEM: TREND CHARTS

Notes:
* CEDAC: Cause and Effect Diagram with Additional Cards modified for the opportunity to monitor the planned/target value - Target (T) and real value - Real (R) in the criteria "5M" (Manpower, Machine, Methods, Material, Measurement), F (Finance), Time (T), Surroundings (s), Customer (C), Environment (E).
** SIPOC: Suppliers-provide inputs to the process; Input-required resources; Process-transforms inputs to outputs, Outputs-delivered products or services; Customers-stakeholders, identify what the process provides and delivers to the customer.
*** KANO model: consumer involvement; research and analysis of the criteria significance, categorisation by so called "candies", "essential", "explicit customer requirements – necessity".

3. CASE STUDY

The mission of the organisation providing services in the field of environmental geology is rational exploitation of the geological structure. Accompanying negative function (and simultaneously project risks) can cause geological hazards e.g. unexpected subsidence, faults and destructive landslides, as well as a burden on the environment (contamination of water, soil, air or degradation of their ecological stability, etc.), utilisation of especially non-renewable or heavily renewable resources etc.

This geological process can be simply described in the following sequential order:

- Design of geological services (technical consulting e.g. Designing projects using environmental technologies and pollution control, geological surveys, hydrological mapping, etc.).
- Performance of geological services, including activities such as exploration drilling, geological surveys, engineering services and supporting activities e.g. remediation, technical testing and analysis, and of course the processing results (evaluating the geological projects and processing final reports, processing and evaluating data from laboratory analysis, calculating, results evaluating, assembling diagnosis and other evaluating geological structures).
- Providing the results of geological surveys.

Basic activities in EGD in the case organisation are: geological surveys, design works, consultative and consulting works, environmental remediation works, laboratory works. Projects in the field of environmental geology are complex consisting of many processes. Control of these processes takes place according to the general principles of project management.

Case study represents the organisation projects in the field of environmental burdens removal.

Process description of project implementation is defined in EGD working procedure. The working procedure is a controlled document of the third level within an established and certified Integrated Management System (IMS). IMS includes the Quality Management System in accordance with ISO 9001:2008, Environmental Management System in accordance with ISO 14001:2004 and Health and Safety Management System in accordance with OHSAS 18001:2007 in monitored case organisation. The EGD working procedure refers to controlled documentation of the second level (the corporate directions etc) and IMS manual (the first level in the structure of controlled documentation in the analysed company). The purpose of the working procedure is to determine principles, procedures and responsibilities for the product realisation in the EGD. The working procedure objectives are:

- to create the conditions for compliance with requirements specified in the contracts;

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- to satisfy the needs and expectations of customers and stakeholders;
- to comply with legal and other requirements;
- to minimize environmental aspects and safety hazards.

Key project success indicators were monitored up to 2010 as the KPIs (see Table 2).

TABLE 2 - MONITORED KPIS BEFORE USING THE EGEOS–PSI MODEL

QUALITY			EFFECTIVNESS
Various findings from control days during the project implementation.	The level of customer satisfaction after the completion of the contract.	The level of criteria in the contract – treaty (geological structures contamination etc.).	The level of economic efficiency.

4. PROPOSED SOLUTION

Despite highly developed integrated management systems in the organisation and achieving high quality of the products and works results, the organisation must be prepared for the evolving competition in the area of interest and the tightening up criteria for assessing environmental burdens.

The organisation, which has a lot of "tacit knowledge", have to know how to transform them into useful information. The organisation must improve the quality of the resulting solutions, innovate procedures and learn to continue activities improvement and success achievement in a competitive surroundings.

Based on the details that we have monitored during 2011 – 2012 and continuously analyzed using EGEOS-PSI model, we found a major strategic task to improve "performance" of the organisation´s management system:

a) To implement of the standard ISO 9004:2009.
b) To apply the principles and practices of project´s quality management according to ISO 10006:2003 (modified according to the update version of ISO 9004:2009).
c) To control change in accordance with ISO 31000:2009.
d) To apply monitoring by KPSIs according to (Parker, 2012).
e) To utilise Barkley´s & Saylor´s methodology “Customer Driven Project Management“ extended by the tools and methods of quality management and quality engineering CEDAC and Kano.
f) To use the Situation Leadership method in complicated cases of the decision.
g) To proceed with the EGEOS-PSI methodology.

Graphical representation of a process map completed by the proposed solution is shown in Figure 1.

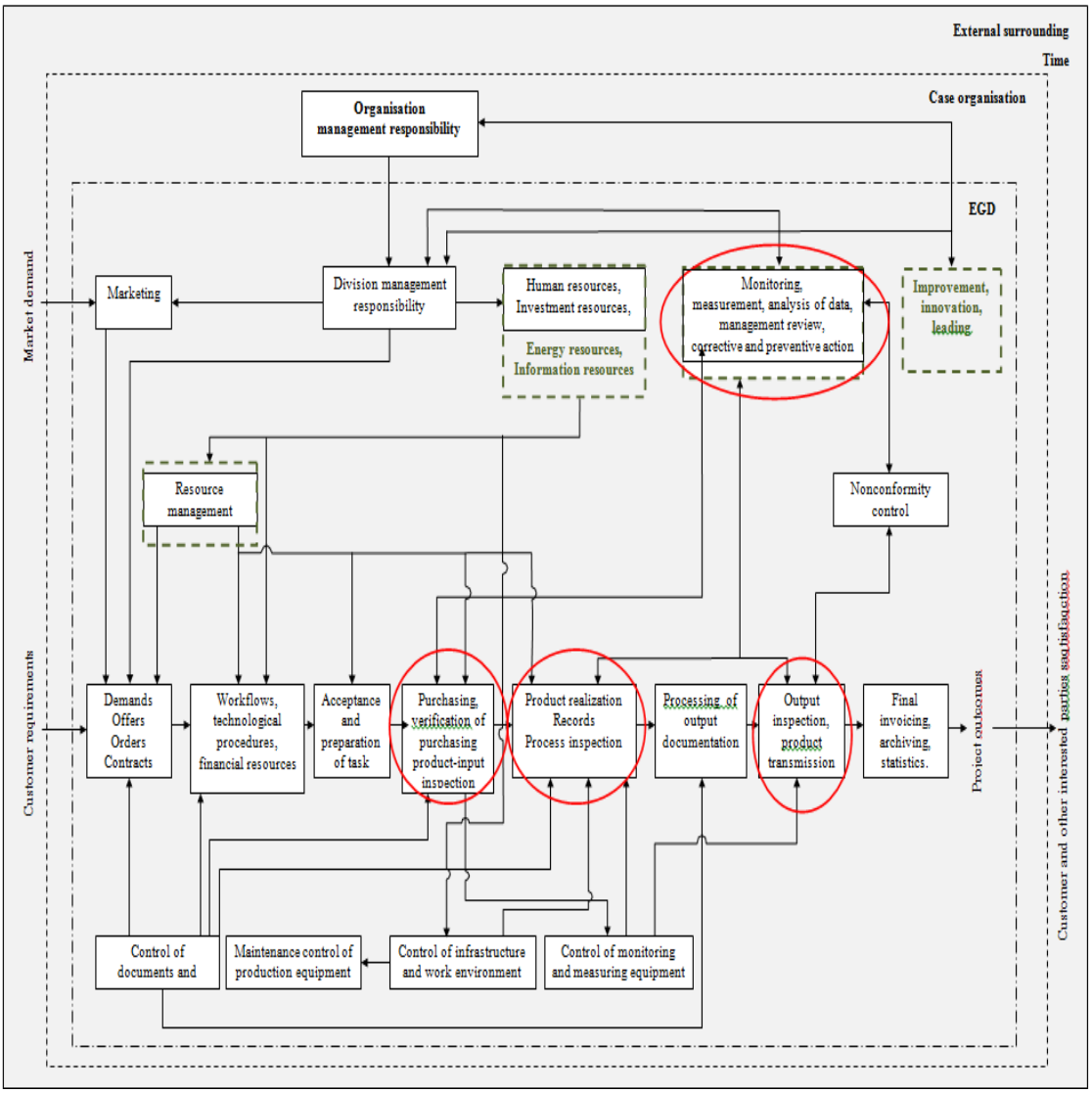

FIGURE 1 - PROCESS MAP OF EGD PROJECTS IMPLEMENTATION - CURRENT AND PROPOSED STATUS
Notes: Red line ellipses – customer involvment; green dot dashed line – ISO 9004:2009 application proposal

The detail of the time-factor monitoring in the project using CEDAC Diagram extended of monitoring of planned and real value is shown in Figure 2.

In the Table 3 are shown the quality factors that were monitored and evaluated using CEDAC diagram in 2011.

TABLE 3 - MONITORED FACTORS (RECOMMENDED) AFTER THE EGEOS-PSI INTRODUCTION

QUALITY				
MAN; MACHINE; METHODS; MATERIAL; MEASUREMENT	SURROUNDINGS	TIME	CUSTOMER	ENVIRONMENT

Problems identified using EGEOS-PSI procedure after the first year of application (2011):

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- Ambiguity of concentrated information on specific projects (contracts);
- Insufficient frequency and appositeness of quality, efficiency and tracebility indicators;
- Complicatedly retrieval of more detailed information from the customer and implement change control.

Monitored KPSIs after the EGEOS-PSI introduction modified according to (Parker, 2012):

Project business analysis indicators [%]: rework requirements; traceability; likelihood of user satisfaction; project team requirements satisfaction; project stakeholder satisfaction; requirements controllability; quality assurance; missing or incomplete requirements; customer satisfaction.

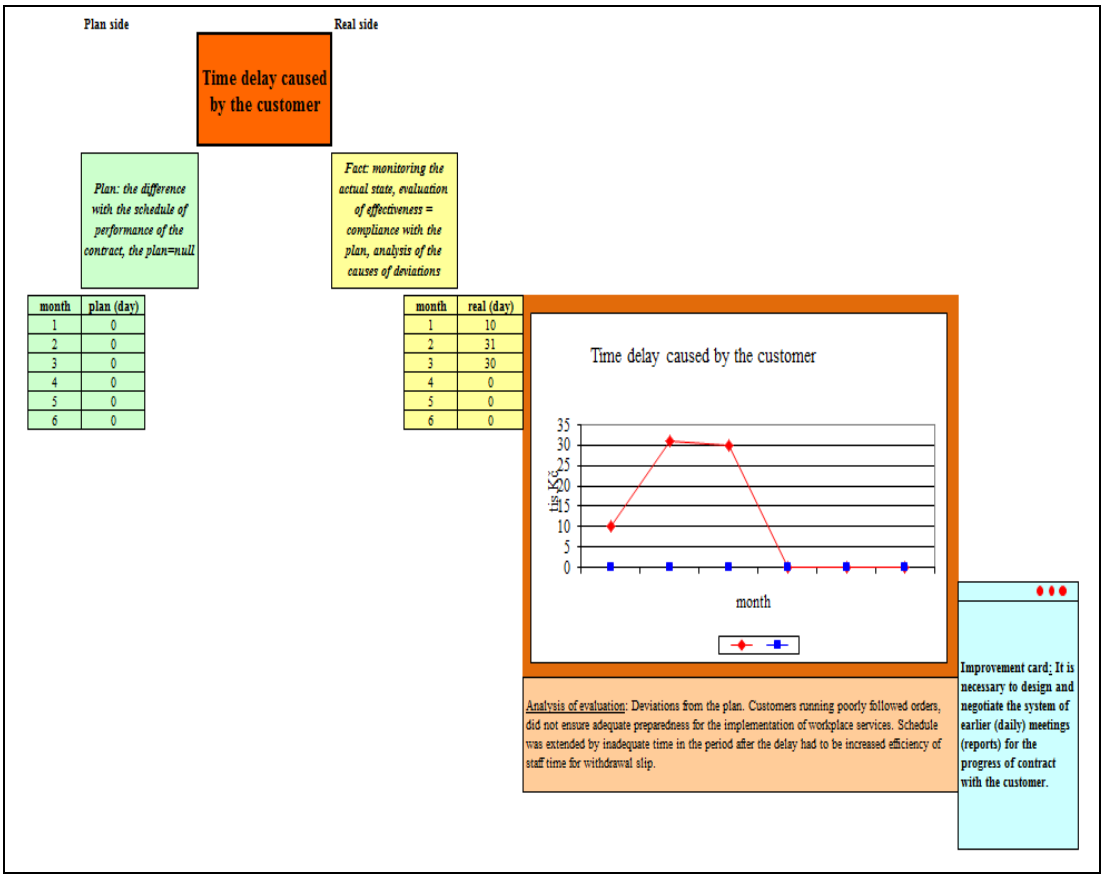

FIGURE 2 - DETAIL OF PROJECT´S MONITORING BY CEDAC DIAGRAM

Project management performance indicators [%]: deviation of planned budget; cost of managing processes; deviation of planned hours of work; deviation of planned time schedule for project/program; missed milestones; overdue project tasks; Budgeted Cost of Work Scheduled (BCWS); Actual Cost of Work Performed (ACWP); Budgeted Cost of Work Performed (BCWP); Cost Performance (BCWP/ACWP).

Project success analysis indicators [%]: deviation of planned Return of Investment (ROI); deviation of Net Present Value (NPV); deviation of planned break-even time; Business Process Productivity (BPP) increase; Cycle Time (CT) reduction.

5. CONCLUSIONS

The paper looked at the process improvement possibilities and the work's results of project organisations providing services in the field of environmental geology. This was done using the original model EGEOS-PSI developed within the thesis. The model uses partial indicators, KSIs, for situation awareness before planning, during, and after the project implementation.

Assessing the quality and effectiveness of geological services projects before applying EGEOS-PSI model was done under internal economic assessment of the EGD activity, respectively of the partial project; and based on overall customer satisfaction analysis after completion of the contract (project); or based on the findings from the inspection days during the project. Effectiveness evaluation was often focused on the contract criteria only (the contamination level of the terrain, etc.). Criteria from other areas of process management (5M + S + T + F) were not considered relevant to the evaluation. Just these areas can have a marked influence on the project success.

The monitoring, analysis and evaluation of KPSIs helped both to intensify the process of remediation, dealing with unexpected reality and new findings, bigger safety, preventing the implementation of remedial work and, of course, to their quality, achieving the excellence of time and money. Because of KPSIs evaluation in the planning, implementation and subsequent evaluation of criteria we concluded that it is necessary to transfer e.g. costs, attention, etc. in other activities. This transfer can allow accelerating work with a positive result, which in turn saves on budget for other problematic tasks.

We will continue to examine the reliability and practical applicability of the research results on more extensive and diverse projects in the organisation.

Certain research limitations where both the ability to anticipate risks and the possibility of suitable involvement of a customer within the project team.

We can conclude that the evaluation of quality according to EGEOS-PSI method is both theoretically and methodologically suited for geological service processes, both for current and prospective customers, because it brings knowledge applicable to improving quality and increasing efficiency.

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