# QUALITY ASSURANCE IN PROJECT MANAGEMENT –PRACTICAL EXPERIENCE

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**Key words:** *Quality, Quality Management System,Quality Assurance, Project, Project Management*


## ABSTRACT

*Quality and Project Management represent two different disciplines, developed independently, but closely related. Successful implementation of a project i.e., finishing it within planned time and resources, as well as delivery of products with required quality, asks systematic approach in planning and implementation, in which very important role plays quality management. To enable quality of products it is necessary to take necessary actions in advance - this concept is known as "quality assurance". This paper discusses practical aspects of quality assurance application within project implementation lifecycle, based on experiences of the Energoprojekt- Entel p.l.c.*


## 1. INTRODUCTION

Quality and Project Management represent closely related disciplines, although they had been developed independently - both disciplines are based on business processes' defining, Quality Management System (QMS) established in an organization is visible in the best way just through Project Management (PM) activities and represents valuable support to project implementation within the organization, and finally, quality of products (goods, software, services) is strongly dependent on quality of processes they are based on.

Quality is „degree to which a set of inherent characteristics fulfils requirements" /1/. The main aim of QMS as management system is to establish, improve and advance business processes in organization which will enable the product delivered to customer to fulfill its requirements, needs and expectations and to attain its satisfaction /2/. To enable quality of products, it is necessary to take actions in advance, during the project implementation, not only at the very end. This concept is known as "quality assurance". This paper discusses practical aspects of quality assurance application within project lifecycle, based on experiences of the Energoprojekt Entel p.l.c. (hereinafter called: ENTEL). Main business of ENTEL is Engineering Design and Consultancy Services related to Projects in the fields of Energy, Water, Telecommunications, Environment protection and PM. Categories of company's products are design documentation (studies, tenders and technical documents), provision of consultancy services and occasionally customer's specific software development.

## 2. BASIC ELEMENTS OF QMS AND PM

Simplified review of QMS's essence is shown at Figure 1 /3/. The first step requires organization to explain how it works – the way organization defines its business processes is verified on market, through its survival. In the second step the organization is required to describe its way of working, to make it accessible to others in written form (on paper or other media). The most important step is the third – the organization is required to obey the rules defined by its own. This is the most critical step in practice – organization can find a consultant which will prepare documents, but carrying out the system is its own obligation, nobody can do it instead of organization. Also, it is very important for organization to provide evidence that QMS is in function with the help of records that document performing of QMS.

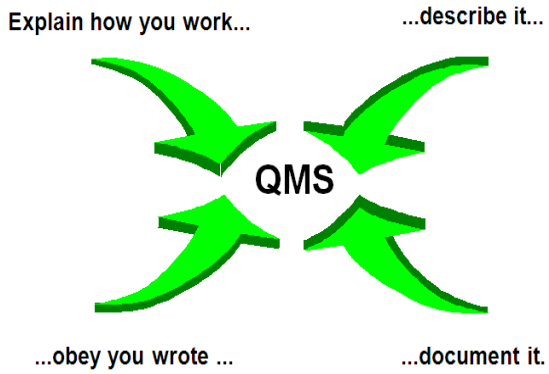


Figure 1: The essence of QMS

Project is possible to define /3/ as „a complex and unique business endeavour undertaken in the future to achieve an objective conforming to specific requirements, within expected time and within planned resources and costs". From this definition it is clear that project is carried out in conditions of several constraints related to time, resources and costs, that make difficult achieving the objective(s). To implement the project successfully under these conditions, particular dicipline is developed, known as Project Management.The essence of the PM concept is shown at Figure 2 /3/ – we are planning, monitoring and control time, resources and costs to achive objective(s).

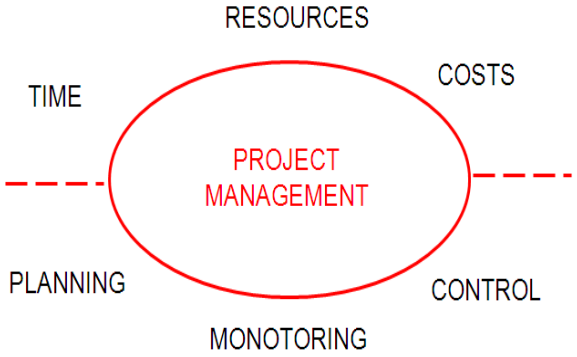


Figure 2: Illustration of PM concept

Upper part of the figure shows elements related to constraints, and lower shows methods to overwhelm these constraints. *Time* is always important element, sometimes decisive for project success. *Resources* is common name for participants in project and material assets used within the project, that should be available when it is necessary. *Costs* are expressed in money and always are limited. To implement project successfully, activities should be planned, its realization should be monitored and some preventive and/or corrective actions should be taken to eliminate or mitigate consequences of potential negative impacts to project finishing.

A Project as business endeavor consists of several phases and activities that engage significant resources, human, material and financing. Similar as human life, from birth to death, it is usually described using concept of „Lifecycle", shown at Figure 3 /3/. This concept enables to break down long and complex projects into smaller, more understandable and manageable parts. The figure 3 shows global phases of a project - initiating, planning, implementation (including monitoring and reporting) and close out.

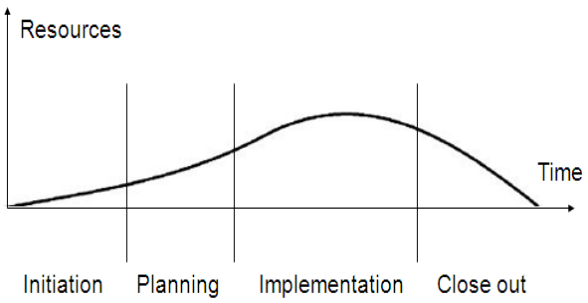


Figure 3– Project lifecycle

This „project lifecycle" is preceded by the phase of bidding and contracting, that enables the project awarding. However, this phase is usually tretaed as separate project with similar phases because it is usually implemented by separate part of an organization (for example marketing).

## 3. ROLE OF QUALITY WITHIN PROJECTS

From definition of a project it is clear that project implementation is very demanded task – it is necessary to meet requirements, needs and expectations of customers and other stakeholders (management, employees, stockholder, suppliers, financial institutions, social community), activities are performed in the future, in conditions of uncertainty and risks, the constraints reduce number of alternatives etc. In addition, successful implementation of project is limited with the fact that several other projects are implemented in parallel with it within organization and more or less have an impact (unfortunately, usually negative) to the project. Figure 4 shows a model of project implementation environment /3/. This model is based on visual interpretation of standard ISO 10006:2003 devoted to quality management in projects /4/. As per Figure 4, project is considered as temporary organizational unit (OU) within home organization coupled with other organizational units within and out of it – customer, supplier etc.

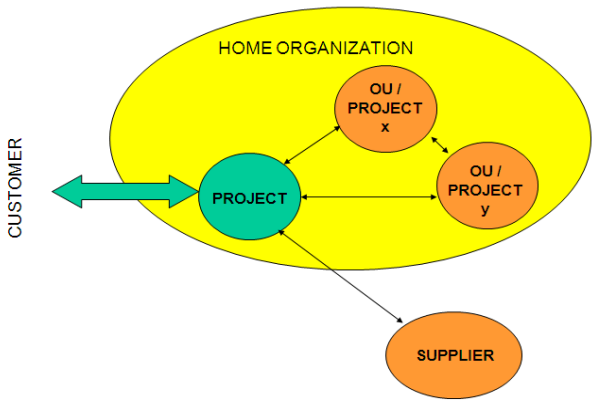


Figure 4: Project implementation environment /3/

This model is better harmonized with concept and requirements of QMS given within standard ISO 9001:2008 /5/. To percieve role of quality in projects, it is necessary to take into account eight principles of QMS (/1/-/3/):

- *Customer focus*: Requirements, needs and expectations of customer are the source and customer satisfaction is the main objective of all activities within organization, as well as project
- *Leadership:* Leader's devotion to quality has a crucial importance for establishing, maintaining and improvement of QMS
- *Involvement of people:* People are an active factor for establishing, implementation and improvement of QMS in organization and within a project.
- *Process approach:* An organization as a whole is considered as a group of mutually coupled processes, both for product realization and supporting ones
- *System approach to management:* Interrelated management systems in organization or within a project contributes to organization's effeciveness and efficiency in achieving its objectives
- *Continual improvement*: Methodology PDCA („Plan-Do-Check-Act") is applied, as a permanent objective both in organization and within a project
- *Factual approach to decision making*: All decisions is necessary to be based on the facts related to problem, resulted from the analysis data and information.
- *Mutually beneficial supplier relationships*: It is necessary to establish long-term mutual co-operation based on partnership

Quality management in projects have two forms– quality assurance and quality control.

*Quality Assurance* (QA) is „focused on providing confidence that quality requirements will be fulfilled" /1/. This process consists of preventive actions oriented to establish conditions within organization, as well as a project to attain quality of products to be delivered, through quality of processes from which these products arise. This is usually attained by establishing, maintaining, improving and advancing of quality management system within home organization and its cerification as per standard ISO 9001. QA within home organization is responsibility of top management and it is manifested through following activities /3/:

- Communicating to the organization related to the importance of meeting customer requirements, as well as meeting statutory and regulatory requirements
- Establishing the Quality Policy
- Ensuring that quality objectives are established, both global and particular per projects
- Ensuring that planning documents are prepared for project realization
- Conducting management reviews related to quality assurance activities
- Ensuring the availability of resources
- Establishing of organizational pre-conditions for quality assurance (department, responsible person, ..)

The role of QA throughout project lifecycle is shown at Figure 5, as an „umbrella“ that protects project from impacts arising from environment that can have negative consequences to project objective(s) achieving. For QA within a project particular importance has the management review at home organization level,. obligation as per item 5.6 of the standard ISO 9001, that covers all elements monitored within organization (including those related to projecs), with aim to improve them.

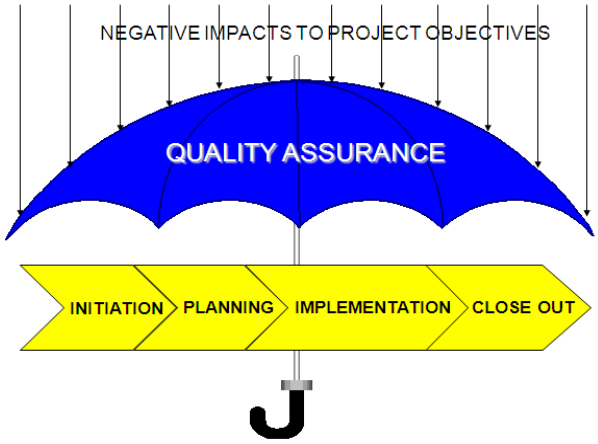


Figure 5 : Role of Quality Assurance in project lifecycle

Quality Control (QC) is „focused on fulfilling quality requirements“/1/. This process is oriented predominantly to technical aspects related to planning, implementation and monitoring of quality in projects, measurement of quality characteristics, performing of corrective actions in case of a deviation from defined quality characteristics.

## 4. QUALITY PER PARTICULAR PROJECT PHASES

*Phase 1: Bidding and Contracting*

This phase includes large number activities as market investigation, presentation of products including pre-qualification documents, bid preparation, contract signing etc. The most important activity within this phase from the point of view of quality is to recognize all customer requirements, its real needs and expectations, to avoid any missunderstandings or disputes in the future. Our obligation is to help custonmers, if necessary, to understand its real needs and better define the requirements.

This approach avoids negative consequences for project implementation and achieves satisfaction of customer by demontsration of organization's commintment.

After defining the requirements, organization has obligation to review them from the point of view of its own ability to meet them (Item 7.2.2 /5/). This review shall be conducted prior to organization's acceptance of contract. If organiza-tion is not sure to its ability to meet the requirements, it is better to give up the contract than to accept something what is questionable - damage suffered will be smaller.

*Phase 2: Initiating*

Implementation of a project starts by establishing it as an organizational unit within home organization. In case of ENTEL's QMS /6/, there is the form „Decision on Project Establishment" - a project is established based on a signed contract, letter of intent or any other document with contract power, or particular decision of the management or the Board of Directors. Formal project establishment has larger importance in practice than it looks like. We officialy inform all stakeholders that the project starts, main participants in project implementation and their roles are identified, person responsible for project plan preparation is nominated, organization of the project is established, some contraints are defined (if any), etc.

*Phase 3: Planning*

There is no any doubt that planning is the most important phase for any project. The phase is implemented by preparation of basic planning document related to the project (known as "baseline"), covering activities to be done, time schedule, resources (human, material financing) to be engaged, products to be delivered, particular costs, responsibilities of participants, quality assurance activities to be performed etc. Within ENTEL's QMS /6/, the central planning document is "Techno-economic Program for project realization" (TEP). The TEP is prepared for each project just after the project establishment to determine key elements for its implementation. TEP includes scope – WBS (Work Breakdown Structure), project objectives, organization for project management, time schedule, human and material resources and costs allocation, quality assurance plan (if not prepared as separate document), responsibility matrix etc. TEP is considered and adopted by the Expert council of ENTEL.

The project quality plan is a document that identifies activities and resources necessary for achieving the quality objectives of the project. This document should be incorporated into, or referenced in, the project management plan. The Project Quality Plan covers plan of control activities including some check points in which control and work activities sould be harmonized.

There are several important things to be pointed out, based on ENTEL's experience:

- The quality inspection should be preformed during project realization, not only at the very and, planned at monthly level, depending on phase of the project
- The Project Quality Manager (PQM) function should be established to prepare Project Quality Plan in coordination with project manager, to coordinate with customer represenatives related to quality, to co-ordinate quality inspection activities within the project etc.
- If it is necessary, organize the Expert Council during the project proceeding, to direct further activities
- Control (check ) points should be foreseen, for reviewing project activities, giving guidelines or taking corrective actions
- Establish the way of product quality verification, including parts or products prepared by a supplier, that has impact to quality of product delivered by ENTEL (control of „outsource" process)
- Organize the Expert Council for final product assessment in time, before final schedule for product delivery to customer
- Establishing of organizational pre-conditions for quality assurance (department, responsible person, ..)

The standard ISO 9001, Item 7.3, foreseens three forms of design and development evaluation - review, verification and validation. „Review" (Item 7.3.4) evaluates the ability of the products to meet requirements and identifies any problems and proposes necessary actions. „Verification" (Item 7.3.5) evaluates if the products meet input requirements i.e. if the results are in compliance with contract clauses. „Validation" (Item 7.3.6) evaluates if the products meet the requirements for the specified application or intended use, where known. This activity is often done in cooperation with customer. Within the ENTEL's QMS /6/ these forms are implemented, as follows:

- Review is implemented by Quality Inspection (QI) Engineers per particular specialties. Their activities are coordinated by Project Quality Manager
- Verification is implemented by the Expert Council, including product delivery approval
- Validation is implemented in cooperation with customers (external design assessment for final design, assessment of basic design by inspection team within authorized ministry, consideration of designs within the Expert Council within customer organization)

Consisting part of basic planning document should be consideration of project risks. Project is planned in this moment, but it will be implemented in the future. It means that we have to identify uncertainties throughout the project, to assess them (its probability of occurence and the impact on the project), to develop plans for responding to risks and to implement these actions.

*Phase 4: Implementation*

This phase is based on the basic planning document prepared within previous phase and adopted at appropriate level within home organization. This plan is worked out by preparing operational plans at monthly, weekly or daily level, up to particular performer. This is the first element of QA in the project – operational plan announce to each person what is part of the job he/she is expected to perform and at the end of planning period represents basis for assessment of their contribution and main element for monitoring and reporting related to the project progress.

In ENTEL's case /6/, after TEP's adoption by the Expert Council, project realization starts by operational planning, engagement of planned resources and reporting. At the beginning of months, each employee receives filled-in form "Order to work – Activity log" with tasks he/she will be engaged within the month, and in which activities during the month will be recorded. If there are any difficulties during project implementation, it is possible to organize the "directing" Expert council to help both project manager and project team to overwhelm these difficulties and implement project successfully. During project implementation, technical review is performed continually by QI engineers per specialties, in coordination with PQM. After preparation, product is verified at the Expert council before its delivery to customer.

Consisting part of project implementation represent monitoring and reporting of project progress. It represents the essence of quality in projects – providing of „written traces" as a form of evidence that system is in function (see Figure 1, step 4). Monitoring and reporting are based on collectiong of information from the processes and its presenatation to all stakeholders in the form undarstandable for them that expresses its interests. Reporting has one very important consequence – if realistic, it enables any problem to be noticed in time and necessary corrective actions to be taken to return the project into planned frameworks. If we find out problem too late, when deadlines have passed and budget is spent, the consequences of these problems can be disastrous for project objective achieving.

*Phase 5: Close out*

The project itself is a process and special attention should be paid to its closure. In most cases, the project is closed when its objectives are achieved, in certain cases the project is closed earlier or later than planned, due to unpredicted events. Whatever the reason for project closure, a complete review of project performance should be undertaken. The project closing is not a moment, it is a proces consisting of several activities /3/:

- Apropriate reports preparation, with elements related to resources (human and material) spent, costs, time schedule and products delivered, with clear assessment of project objectives' achievements.
- Providing of completion certificate as an evidence that organization was engaged at this project and that the project finished succssfully.
- Archieving of final delivered version of the product (if applicable) to enable use in the future for any reasons. In case of design documentation it means to keep text and drawings, in case of software it is necessary to keep source code and appropriate documentation, in case of building it is necessary to keep As-Built documentation etc.

- Make some conclusions as experience form the project, as some kind of „lessons learned“ for future projects.
- Systematize (arrange) all relevant records related to the project in paper or paperless form.
- Provide main information to marketing related to the project, as an element for future marketing activities
- Publish main results of the project. Celebrate if you have a reason for it

Within ENTEL's QMS /6/, there are two forms that are necessary to be filled-in at the end of the project – "Preliminary / Final finished project report" and "Order to complete the project". The first one includes confirmation of the head of QMS department that CD with final version of documentation is provided, and the second requires to provide completion certificate from customer. After signing of this order by authorized manager, no any additional activities or cost related to this project are possibble. Reports per particular projects are summarized within Management Review Report prepared annualy with main idea to identify problems and to improve processes in future projects implementation.

## 5. MISLEADS AND PREJUDICES RELATED TO QUALITY IN PROJECTS

The most often misleads and prejudices related to quality in projects are presented, per project phases are:

*Bidding and Contracting*

- „We know better than customer what he needs?!“. Organizations depend on their customers and therefore should understand their needs, to meet its requirements and to exceed their expectations /1/. The main idea is to help customer to express its real needs and to do our best to meet them. Organizations exist because of customers, not conversely!
- „It is the most important to get the job, later we will handle it as we know?!“. These situations are too dangerous and should be avoided. Sometimes is better to give up the job, than to endanger organization's survival with contracts under suspicious conditions

*Planning*

- „This project is too short to be subject of planning?!"
- „This project is similar to previous, there is no need to plan it?!"
- „Let we work, we don't have time to prepare this formal papers?!"

Common idea of these attitudes is to find reason not to plan the project. This is typical for „problem oriented management" – to allow people to work without any organization, and in case of (certain) problems to take the role of „rescuer", to show that nothing is possible to be done without them. The consequences of such a approach are longterm and disastrous – instead of establishment of defined processes, maximal improvisation is imposed in which all outcomes are equally probable, and after (certain) failure they will find a culprit!

*Implementation*

- „This project is late, we will resolve it by overtime work?!"
- „This project is late we will add new people?!"
- „This project is late but we will compensate it by quality of product delivered?!"

Overtime work is one of possible solutions, but short-term. Adding of new people often causes that project is late more, bacuse it is necessary to engage members of project team to help to new-engaged ones. In addition, when you sign a contract, you accept to do the job with some level of quality and no any late should compensate it. Budget (resources), time schedule and quality are crucial elements of your contract obligation and no any exchange is possible.

*Monitoring and Reporting*

The most common problem is absence of reports or its inadequate preparation. In this way, it is not possible to make adequate decisions related to the current project and many valuable information is lost for future projects.

*Close out*

Organizations often do not keep final revisions of delivered products (if applicable), because project managers „don't have time to deal with it". This approach endangers future activitieas of organization, because it deprives itself of its accumulated experience.

*Project Manager Role*

In practice, there are a lot of misunderstandings related to real role of project manager. People usually connect his role to expert knowledge in the area the project is related to. But, it is necessary to have in mind that main task of a project manager, together with his team, is to manage the project to enable achieving of project objectives.

## 6. CONCLUSION

In this paper we summarized some aspects of quality in projects and than illustrated it through practical experience. It is very important to understand that quality plays significant role in project lifecycle and enables to achieve project objectives. A sentence says that „The World is full of capable people, only capable managers are missing to organize them!". Application of quality management principles into project management is one of possible ways to do it.

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