

## Chosen aspects of project management

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### Industrial management and organisation

#### ABSTRACT

**Purpose:** In this article a problem of project management (PM) was presented. There was special attention given to objectives, scope of the project and project costs. Moreover, an analysis of project management in chosen organisation was made.

**Design/methodology/approach:** The methodology of project management was shown. A problematic areas of project management (project quality, project risk, time and costs in a project) were discussed. Chosen stages of PM were practically checked in a selected organisation.

**Findings:** In this paper an example of projects classification was presented. The features of project plan were proposed. The necessity of carrying out audits was presented. In the article a threats analysis and a time control were shown.

**Research limitations/implications:** The fundamental purpose of a project management is to achieve success with a proposed budget and schedule. In this case quality, cost and time are the main parameters of the project, significant for the project realisation and evaluation of project results.

**Practical implications:** In the paper practical directions of project planning, realisation and termination were presented. This makes possible minimization of project failures and a positive effect in a project realisation.

**Originality/value:** The analysed PM process in the organisation allowed to know modern project management tools and techniques from a practical side. The realised project was finished with success because a working team had knowledge and experience in the project management.

**Keywords:** Industrial management and organisation; Project management; Project planning; Project cost; Milestones

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### 1. Introduction

Today, the design notion means all actions organized to achieve a specific purpose, and not just an activities plan, but implementation. According to 'Dictionary of the Polish Language', one can be familiar with notions like project and design. The project is an intentional plan of action, proceedings, idea or plan, draft, etc. While design means arrangement of projects, plans, something intend or development of a project, such as construction, architectural, technological. In other words, with more modern views on design, it can be concluded that design can be at least partially identified with the project management.

The project management is defined as planning, organisation, monitoring and control of all project aspects and motivation of engaged people to achieve project objectives according to established time-limits, costs and criteria (Fig. 1) [1-4].

Generally, two approaches to project management are used today. 'Traditional' approach identifies a sequence of steps which must be done. In contrast to this, in the second design approach the project is seen rather as a collection of relatively small steps than as a complete process.

In the project practice there are many organisation developing methodologies of project management: Association for Project Management (APM), Australian Institute for Project Management

(AIPM), Japan Project Management Forum (JPMF), Project Management Institute (PMI).

According to PMI, the project management can be divided in 5 phases [3-9]:

1. project initiation,
2. project planning,
3. project realisation,
4. project monitoring,
5. project termination.

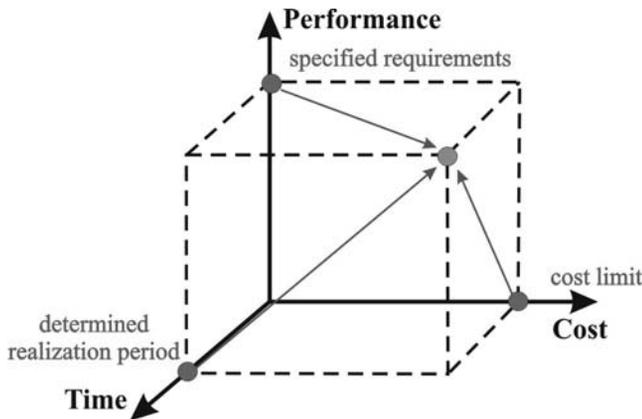


Fig. 1. Basic project objectives [1]

However, not every project goes through all these phases. Some projects have less phases, while others get through some of steps several times.

The project management usually includes the following variable factors [5,8,9]:

- scope of project,
- time for project realisation,
- project costs (budget),
- quality,
- risk.

## 2. Characteristics of the projects

In the traditional engineering approach project is often understood as a construction record. In this approach a different understanding of design notion is presented [10]:

- structural design, which purpose is a preparation of a shape and geometrical characteristics of products that fulfil human needs,
- technological design, which purpose is the methods development (technological process) to give required geometric features and properties of designed product.

In fact, the project tending towards production and selling a new product is much more complicated and contains these elements, but also a number of others. That allows to name this process as a project management, which is very close to the enterprise management [4]. Modern engineering design processes, except for technical aspects, increasingly have to take market, quality, economic and environmental aspects into account (Fig. 2).

The projects can be classified in different ways, taking into account specific character of a sector in which the enterprise exists or individual features of realised projects. The following types of projects can be distinguished under this criterion [4]:

- a) classification of projects due to their complexity:
  - number of engaged persons, departments, organisations and countries - organisational degree of complexity,
  - engaged resources, time, capital, processes - complexity of engaged resources,
  - level of innovation of created product or project course - technical degree of complexity,
- b) classification of projects due to subject of an action:
  - projects of basic examinations,
  - preparation of products,
  - prototype construction,
  - systems preparations,
  - preparation of methods,
  - projects concerning modification of existing systems,
- c) classification of projects resulting from work phases concerning preparation of a new product, its implementation and development:
  - projects of basic examinations concerning different fields of science i.e. artificial intelligence, robotics,
  - projects of applied examinations, which have specified purpose i.e. building of a computer program and device prototype,
  - rationalization projects which purpose is optimization of existing organisation structures and processes and creation of a new,
  - projects which purpose is creation of a material system consisting of typical or earlier known elements,
  - projects which purpose is device exploitation control or other system with its maintenance.



Fig. 2. Areas of design process [11]

### 3. Problem areas of project management

At the beginning the customer needs which have to be described by him should be taken into account. Then a formal formulation of these objectives and their inclusion into the scope of design work have to be made [11]. If the client is a company it is necessary to provide a model needs, which can be the basis for a project beginning e.g. market demand, business needs, customer order, technological progress, legal requirements.

When considering the needs one should take into account different types of people and organisations that are actively engaged into the project with their different needs and expectations.

The main project objectives are: time-limits, costs and productivity, which are the result of carried out activities [4]. They define duration of project phases, costs that may be incurred to make the product or service in the project.

The project is divided into main goals and sub-goals. The main goals are assigned to the program that has many projects and sub-goals for each project.

#### 3.1. Project planning

Project planning is a systematic gaining information about the future course of the project and the conceptual expectation of necessary actions [8]. It is recommended that the project plan was as short as possible and it was characterized by following features [12]:

- it should allow all members of the project team to understand the essence of the project,
- it should allow for understanding of the project by management of the organisation in which it is implemented,
- it should explain a client the essence of the project, as it is understood and formulated by the project team,
- it should be a basis for the preparation of proposals for a client, if such proposals are required.

The project plan is used to project realisation control, as well as for documentation of objectives of this plan.

For the purposes of the project, the plan includes [3]:

- planning of a scope of the project,
- work breakdown structure planning,
- planning of a process,
- planning of involved resources,
- costs planning,
- risk planning.

#### 3.2. Project quality management

All kinds of projects should be compatible with ISO 9001 standard [14]. The quality planning includes identification of adequate standards connected with the project and determination how to fulfil requirements contained in them.

The top management, with the participation of qualified persons should develop and establish a common quality policy. The policy should be clear and understandable for stakeholders, inside and outside the organisation, periodically reviewed and amended.

In the quality management system as well as in the environmental management system and the occupational health and safety management system, the basic method used for strategic control is an internal audit which is completed by periodic system review made by top management [13].

The universal character of an audit makes possible using of its effects at the strategic and operational level. During an audit many methods are used. To the universal methods for auditing are included [14]:

- conversation,
- questionnaire (only in special cases),
- analysis of collected samples of records and documents,
- analysis of procedures and other system documentation,
- comparison and results analysis of these methods application,
- interview with check-list using.

The additional task of an auditor is recognition of effectiveness and efficiency of the system based on 8 main factors helping in the quality goals achievement [13]:

- client orientation,
- leadership,
- employees commitment,
- process approach,
- system approach to management,
- continuous improvement,
- fact based decision making,
- mutually beneficial supplier relationships.

#### 3.3. Project risk management

The risk management is a process of identifying, analyzing and acceptance of different types of risk and uncertainties, which can have influence on the project. The risk analysis depends on determination of possible, future threats and probability of their occurring [2].

The threats are situations having a negative influence on the project result. They have an influence on the project goals concerning works scope, costs, schedule and quality.

Risk estimation and risk management start with identification of types of threats. The threats which have a source inside and outside of an organisation are considered. Below, a list of potential threats identified during the project realisation is presented [12]:

1. Enterprise environment (lack of budget, lack of project approval by the management),
2. Project environment (unclear project objectives, lack of costs estimation, life and health hazard during the project realisation),
3. Client (lack of understanding of the project rules, lack of experience in the project realisation by a client),
4. Final user (final user was not involved for determination and acceptance of requirements, final user was not included into the project),
5. Technical solutions (lack of solutions, using unverified methods, tools and techniques during the project),
6. Subcontractors and other human resources,
7. Quality (lack of understanding of quality requirements, lack of quality documentation),

8. Project management (lack of experienced project manager),
9. Contracts and law matters (in the project contract there is a conventional penalty expected),
10. External factors.

In the moment when the types of threats and their probable influence on the project are known risk management plan is prepared. The process of a plan preparation has an analytic character. Its goal is finding a balance between risk cost results and cost of its control.

In Table 1 threats identified in the project were presented.

The process of threats identification includes following steps [3]:

- information statement about events causing the risk and their effects - the second column of the table,
- determination of probability of individual threats occurring, definition of their effects level and determination of threats category - the third and fourth column of the table,
- cooperation with experts - possibilities of impact on individual threats - fifth column of the table.

### 3.4. Time management in the project and milestones

The project management consists of following processes [15]:

- definition of project workings (determination and documentation of parts of the project),
- determination of activities sequence (all connections among project parts - on this basis an actions schedule is created),
- valuation duration,

- schedule elaboration (each operation of the project should have a start and the end date),
- schedule control.

The large projects planning is based on a schedule elaboration method which is easy enough to use. In a large organisation the project plan is usually presented in a schedule form with important deadlines - milestones [3]. The milestones show termination of important stages of the project. They are constructed to ensure an effective control. The important milestones are: start of works, termination of one of the project phases (preliminary project, primary project, detailed projects). The criteria for milestones defining include:

- a) start and termination of time limits:
  - whole project,
  - project phases,
  - partial projects,
  - work packets,
- b) test time limits and consumer transfer:
  - equipment,
  - documentation,
  - software,
- c) points connected with other projects,
- d) moments control:
  - requirements control,
  - construction control,
  - acceptance control.

The milestones are an important tool in the project management, for organisations and management.

Table 1.

Statement of threats and proposals of action tactics for research project (extreme, high, average values are compatible with five-stage scale of risk estimation according to PN-N-18002 standard) [3]

No.	Threat and effected area	Probability and effect	Category	Proposed tactic activities
1	Project has not received of a budget. Cost	very high 80-100% extreme (5)	External business	Decrease. This is necessary to prepare the project plan and budget limit.
2	Project is not important for university. Quality	very small 0-20% high (4)	External caused by decision-makers	Acceptance. Observe whether the threat does not appear.
3	Employees have not appropriate qualifications. Quality	small 20-40% high (4)	Internal endemic	Decrease. Employees must be carefully chosen.
4	Quality requirements were not documented. Quality	average 40-60% average (3)	Internal caused by decision-makers	Decrease. Quality requirements should be determined.
5	Lack of employees motivation. Scope, quality, time	high 60-80% high (4)	Internal endemic	Decrease. Motivation system should be developed.
6	Lack of information access. Quality, scope	average 40-60% high (4)	External endemic	Decrease. Funds making possible information access should be planned.
7	Limited manager's authority. Scope, cost, quality, time	small 20-40% high (4)	External caused by decision-makers	Decrease. The scope of the manager's authority should be clearly determined.
8	Too wide research scope. Quality, time	average 40-60% average (3)	Internal business	Decrease. The scope of research should be limited according to possessed resources.

### 3.5. Project budget

Budget process includes creation, acceptance and budget control in the project. It depends on planning of costs of all resources applied in the project. It is also a method for enterprise resources allocation. The important document during the budget process is a budget realisation report. Three phases during a budget construction are presented [15]:

- time and responsible persons for preparation and realisation of the budget determination,
- budget construction:
  - costs planning formulation,
  - control of accepted cost planning realisation,
  - identification of deviations from cost planning and their causes determination,
  - deviations correcting,
  - modification of cost planning or creation of a new one,
- project realisation control.

The phases of the budget process are presented in Fig. 3.

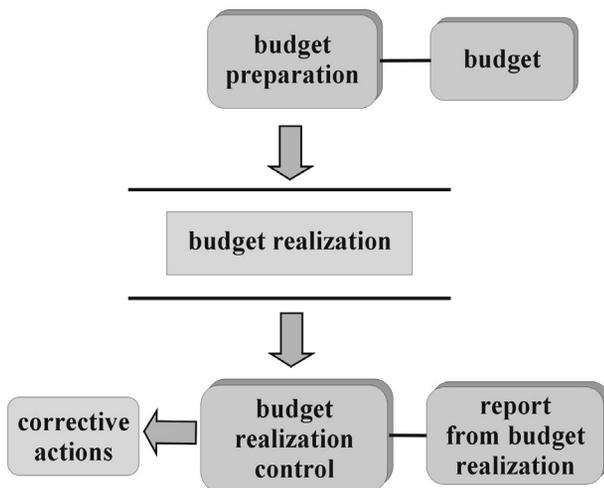


Fig. 3. Phases of a budget process [17]

In the organisation budget determined a value of expenditure for introduction and implementation of new projects. The project budget should have included a financial reserve in the range of 5-10% of cost predicted. It is determined on the basis of predictable costs of the various phases of the project.

The budget control is led after realisation of the various project components in respect of predicted costs to the real costs. To finish this step a report on the budget implementation is created. That is a basis for modification of the costs plan [17].

## 4. Analysis of the elements of selected project

The analysed project identifies following actions to be done:

- building of desulfurization installation,

- modernization of switching station and buildings of measurement control,
- development of 2 sulfur recovery installations,
- building of acid gas enrichment installation,
- building of gas drying installation.

In the preliminary phase a team consisting of members of the organisation and a client was appointed. The management team established a specification of all installations required in the project. A list of suppliers, a cost calculation and a schedule were prepared.

The preliminary phase makes possible analysis of the project, so a model of preliminary project phase should be done (Fig. 4).

In a planning phase the project goals and project tasks with a start and a termination time were defined.

### 4.1. Project team

The analysed project required the cooperation of qualified engineers from various branches (building, casing string, mechanical and electric measurements, process and project control).

In the project a manager was assigned. To his duties belonged:

- recruitment of project members,
- presentation of a tasks program for a project team,
- activities coordination,
- negotiation with superiors,
- specification of necessary resources,
- settlement of work stages,
- budget management etc.
- The necessity of connection of many branches required appointment of leaders for individual branches.

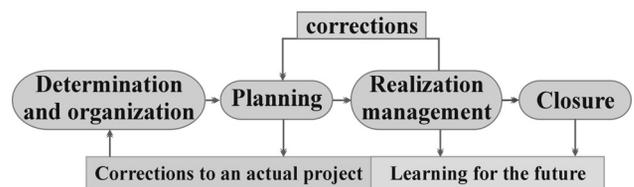


Fig. 4. Model of an analysed project management

### 4.2. Quality in the project

During the analysed project 2 audits were carried out. In this way the quality of realised tasks according to internal procedures and requirements of ISO 9001 standard was checked. The audit was based on discussions with the project manager and leaders of individual branches, as well as with other team members. Each person was required to present basic operational documents. The operating system in the analysed organisation is composed of operational documents and systems. The operational systems create: operating system requirements (so called quality manual) and operating system implementation plan.

Operational documents include:

- procedures (defining organisational structure, responsibilities and requirements),
- project management manual (describes in detail methods and directions of the project realisation),
- project baseline - documents defining requirements, they are a basis for the project realisation, control and financial results achieving. The project baseline includes:
  - contract,
  - scope of the project,
  - project execution plan,
  - project evaluation,
  - risk estimation,
  - cost calculation.
- project procedures manual,
- activity plan - defining activities connected with every function in the project; includes: work instructions and check-lists.

During audits it was checked whether the tasks are realised according to the newest project data. The results of both audits were estimated positively.

### 4.3. Project control - milestones

In the analysed project 2 effective methods for the project control were used:

- budget monitoring - this was based on a comparison of actual results for a given period with the values established in the budget,
- quality control.

The milestones are meaningful events which show employees at which point of the work they are. The milestones are determined by a manager in agreement with a client. They are treated as important and critical points of the project, presented in a diagram form with activities that have to be done and execution time.

In the project 3 time-limits were established and presented in a diagram. The first inspection was after finishing 1/3 tasks of the project. The client got an outline of actions undertaken by all branches. At this stage it was not specified an overall dimensions and shapes of equipment, because mechanical, electrical and process calculations have not been made. Another review took place after 2/3 of the project works. Then were already known mechanical calculations and suppliers data. The last review took place after finishing the project. At each stage the client had the opportunity to make comments, 3D model visualization was also helpful in this.

## 5. Conclusions

The project management is a discipline of management dealing with application of available knowledge, skills, tools and methods to achieve the purposes of the project preparation and implementation, that means the fulfilment of requirements, realisation of the project within determined period of time, upkeep

of costs of the project within determined limit. The notion of project management is very capacious and includes various activities. The project management is an interdisciplinary knowledge connecting many areas [18].

The project manager always works in a dynamic triangle of dependence: time, budget and scope. The time-limits requirements are usually crucial.

In today's changing environment an answer to customer needs, a pressure on innovation and effective cost management decide about the success or defeat. For a growing group of companies the answer strategy to these new challenges is the application of project management principles.

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