# The Issues Concerning the Application of Multiple Evaluation Methods for the Projects in Lithuanian Companies

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**Abstract.** In this paper the methods for financial resource management related to project planning, its implementation and control reaching for goals set, are analyzed. The accomplished empirical research allowed to assess the implementation tendencies of evaluation methods for projects in Lithuania. The application of economical-financial evaluation methods, the methods of financial resource planning and budgeting in Lithuanian companies was determined, identifying the reasons for which these principles are kept or not and distinguishing their application problems as well.

**Keywords:** principles of project management, GANTT, PERT, CPM project evaluation methods, project earned value.

## 1 Introduction

In worldwide practice, the principles of project management are widely applied in companies belonging to both private and business sectors. Normally, these methods allow companies to adapt to environmental changes easier, what is especially relevant in the context of globalization process. The implementation of several principles of project management in the company activity is currently being applied more and more widely in Lithuanian companies as well. Partially, such a tendency is related to that it quite a large part of economical subjects are seeking to use funding from European Union funds and give applications for the projects. Commonly, the activities of these projects are required to be distinguished from the general context of company activity and to give elaborate reports about the progress of the project, cost, income, impact on the company and its external environment. However, the project management is not only related to the received funding. The growing number of companies which begin to resolve their activity in separate projects in everyday activity is noticeable.

When implementing the principles of project management in the companies, the distribution of financial resources becomes an important problem, because company‘s

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financial resource management is one of the most important and ``sensitive" elements of business management. When the methods of project financing are rightly chosen, the appropriate financial resource planning, thoroughly evaluated investments and their profit can condition the business development and success.

**The Aim of the Paper:** to analyze the aspects of application of evaluation methods for the projects in Lithuanian companies' activity, in terms of the application of multiple evaluation methods for the projects.

- To analyze the methods for financial resource management related to project planning, its implementation and control, reaching for goals set.
- To do an empirical research which would allow to reveal the implementation tendencies of project evaluation models in Lithuania.
- To determine the project economical-financial methods and methods of financial resource planning, budgeting in Lithuanian companies, identifying the reasons for which these principles are done or not and distinguishing their application problems as well.2 Paper Preparation.

## 2 Financial Resource Planning and Distribution

A rational enterprise resource planning (ERP) is one of the most important factors in seeking for leading positions in the market and determining the development of company activity. The resource distribution and their effective management is related to many processes, which take plane in the company's everyday life [12].

According to White [26], the financial resource management is one of the most important aspects in project management, because it is directly related to the formation of the activity and finance distribution within time and place. Choosing the method of finance management, a company can begin to plan the finances needed for project management. There exist several methods of financial resource management, which allow to determine when and what resources are needed for the company implementing the project. The resource planning is related to financial resource distribution [10], [12], [11], because it is necessary not only to invest in goods and services being purchased, but also to evaluate additional cost such as conveyance, storage, insurance and so on. In order to set the activities within time, and at the same time to anticipate when and what resources will be needed, Gantt and PERT methods are used.

Henry Gantt's visual method, created in 1920 approximately, was the originator of planning methods which focused on the specific tasks over a particularly determined period. The creation of Gantt table was a first step in developing many other visual and organizational methods for business projects. Gantt table compares time on x axis with different finances needed in order to do the tasks put on y axis [8]. Gantt's merit is the first time line tables, however separate hypothesis still bring forward an idea that similar tables were used for the building of Egyptian pyramids [8].

Another medium for putting activities within time- PERT scheme (Program Evaluation and Review Technique) - was created in 1959 with the purpose to simplify the planning of big and complex projects. In this scheme the explanations can be entered, giving the opportunity to plan the project not knowing exactly the details and durations of all the activities. This scheme is more oriented towards separate cases rather than recurring projects. It is used in the investigative, developmental type of projects.

PERT scheme is a simplified PERT method for project management, which ideally applies to the early stage of project management, when time for works has not been set yet accurately; then works are considered as random variables with a supposed distribution of probability. PERT chart can be optimized relating two types of cost: (a) direct cost for each work, which increases when finances increase, budgeted to reduce the work time; (b) indirect cost which is related to a complete duration of the project. This cost is directly exponential to the general duration to finish the project.

The alternative to PERT is named the critical path method (CPM) of DuPont Corporation, which was created in 1957 [19]. In both PERT and CPM methods for project planning and management, a network is used which pictures correlation between the works related to the project. In this case, networks become useful or necessary in order to create empty works and ascertain the priority connection between the activities. The difference between these two methods is that using CPM method, critical path usually can be determined by tracing the works which reserved time is equal to zero in order of the accomplished proceedings. The sum of the periods for the accomplishment of works in critical path shows the shortest possible period to finish the project [17].

## 3 The Reciprocity of Project Management Processes in Terms of Limitation of Financial Resources

The implementation of principles of project management in practice is more often related to the efficiency of financial resource management in private business companies, which reduces their cost and improves the results. As Romberg [21] notices, in his analyzed companies in 1990-1998, when starting to implement the principles of project management, despite the new technologies, the budget for the projects was exceeded in most cases (almost in 89% of companies). However, according to the author, when the American concern "Gartner Group" related the principles of project management to the control of cost distribution, it achieved especially good results, allow to increase company's sales by 20%.

Financial resource is an essential condition for continuous company activity and development [9], [1]. One of the main tasks, initiating project management processes for a company, is „a sufficient" amount of financial resources that ensure a succession of these processes. Financial resource management gives company an opportunity to comply with project terms, realization of production size and its cost price, because this guarantees profitability of a project [11]. A received amount of resources is influenced by the company's control, payment forms and methods, financial situation and discipline of a purchaser, production quality and other factors.

**Financial methods for project management.** In theory, usually several project evaluation methods are distinguished. Normally, all companies' projects are expressed in financial indexes already during the planning stage [11]. As American Strategic Management Institute states, the project evaluation methods are one of the main factors which determine further decisions concerning project implementation. [15], [23], [6], [7] distinguish three main methods for project financial resource evaluation and use: Net Present Value (NPV), Internal Rate of Return (IRR) and

Payback Period methods. When applying NPV method, all the forthcoming money flows for the planned project are recalculated to the equivalent amount of money at the moment of current time, withdrawing initial investments and evaluating interest rate of the credits proposed by the banks. Since, according to the definition, profitability rate is the interest rate to which net present value is equal to zero; counting with this rate, discount costs of a project are equal to discount income. A Company, applying IRR method, determines "preferential profitability rate" which is least acceptable and compared to the practicably receivable profit. A project, of which profitability rate is higher than the comparable one, is acceptable to a company and it is analyzed further. If calculated profitability rate is less than the comparable one, then it is considered unacceptable. Payback period shows a relative attractiveness of investment offer. It determines what will be the amount of periods needed to reimburse an initial investment. It determines how many periods will be needed that cumulative usefulness of investment project would equal to its cumulative cost. In this method, it is being operated with money flows that are both for project usefulness and its cost is expressed in money flows. For each of the project alternatives, payback period is calculated and received values are compared with each other. Then an alternative is chosen which payback period is the shortest.

**Multiple methods for project management.** According to Loshi, Al-Mudhaki and Bremser [14], budgeting involves the process of whole information processing, which however, is essential, in order to evaluate cost for the planned activities. In many analyzed cases [14], during the performance time of mentioned processes, project cost is examined. However, there is another performance method of this process which involves project earned value (EV) evaluation as a medium for the progress measurement.

This method shows a direct relationship between project earned value and the percentage degree of accomplishment. Earned value has three main features: (a) it is a simple and consistent measure to evaluate project progress, (b) earned value method allows to analyze project activities constantly, (c) allows to compare cost between project activities. Usually, in the earned value analysis, when evaluating the recipiency of accomplished work, monetary and time units are used. By earned value method budget is formed, so called planed budget of planned work, which directly determines the amount of company's used financial resources related to planned activities [13]. The comparison process is done between:

*Budgeted Cost of Work Scheduled* (BCWS), which is equal to project Planned value (PV) [16]. In it, budget confirmed in the beginning of a project is given, which is directly related to the works scheduled in regard to time and cost [20].

*Actual Cost of Work Performed* (ACWP) or Actual Cost (AC) [16], which is described as actual cost for the activities performed [20].

*Budgeted Cost of Work Performed* (BCWP), which is equal to project earned value (EV) [16]. It is evaluation of actual performed activities, considering the schedule of works planned [4]. In this case a simple calculation is done- earned value (EV) is factually equal to actual budget cost or Budget at Completion (BAC) multiplied from a percentage of work completed ( %, COMP)( EV = BAC*COMP %) (this value shows actual value of actually performed works over planned period of time and is measured by monetary units).

The use of Earned value method allows companies (a) to manage the performance of the activities and update schedule, (b) to determine and register current cost for every activity performed, (c) to calculate total earned value for every activity and project and (d) to analyze data and prepare the report of performance and progress.

When drawing earned value system it is important: (a) to make a work breakdown structure (WBS) [3], which divides project into its constituent activities (or merely into manageable parts), (b) to calculate and distribute cost for each activity, (c) to plan activities in separate periods of times and (d) to budget [20], scheduling the cost planned and works performed.

In Aramvareekul, Seider [4], given Cost-Time-Risk Diagram (CTR) is another method for project planning and management. The authors expect that Cost-Time-Risk Diagram will help project managers to evaluate project risk problems by managing implementation of time and cost distribution in one diagram [4].

Cost-Time-Risk Diagram shows the relationship between cost and time of the current project, related to possible rinks. This diagram is an advanced analysis of Earned Value Management (EVM). This diagram is as a map of project implementation control. It helps project manager to make more effective decisions during the project implementation period. By using this method, project managers can watch the performance of time and cost distribution in the same time diagram which is important for making the decisions related to the combination of time and cost. Without combination of time and cost, Cost-Time-Risk Diagram distinguishes risky and useful points for each period of project implementation. Risky and useful points are evaluates and used in Cost-Time-Risk Diagram in order to ensure timely project implementation not exceeding the budgeted finances [4].

Earned value analysis (EVA) and earned value management (EVM) is a main method for project management in concordance with Cost-Time-Risk Diagram. Cost-Time-Risk diagram is a combination of earned value analysis and risk management.

In accordance with the authors, risk management is an important aspect of quality security, using the main analysis methods and performance measurements in order to ensure that risks are properly identified, evaluated and controlled.

This method can become an effective medium to project managers when determining the deviations of project implementation in time and budget planning. The graphs in Cost-Time-Risk Diagram give the schedule of current project with integrated risk evaluation for each period of time. Risk evaluation is an important aspect of project planning and management, improving the decision making and reducing the possible indetermination [4]. If risk is not being controlled effectively, the unplanned occurrences could seriously threaten the projects; then, as a result, the overrun of budget, the inadequacies in time schedule, quality problems and/or unrealized goals are possible. Cost-Time-Risk Diagram is also an effective medium for management of decision making, especially for compatibility of time and cost.

Using this method in the first stage- the work breakdown structure is made. Then, similarly as in earned value method, three types of cost are compared: (a) budgeted cost for work scheduled (BCWS), (b) actual cost of work performed and (c) budgeted cost of work performed. This comparison, with the help of software, is “transferred”

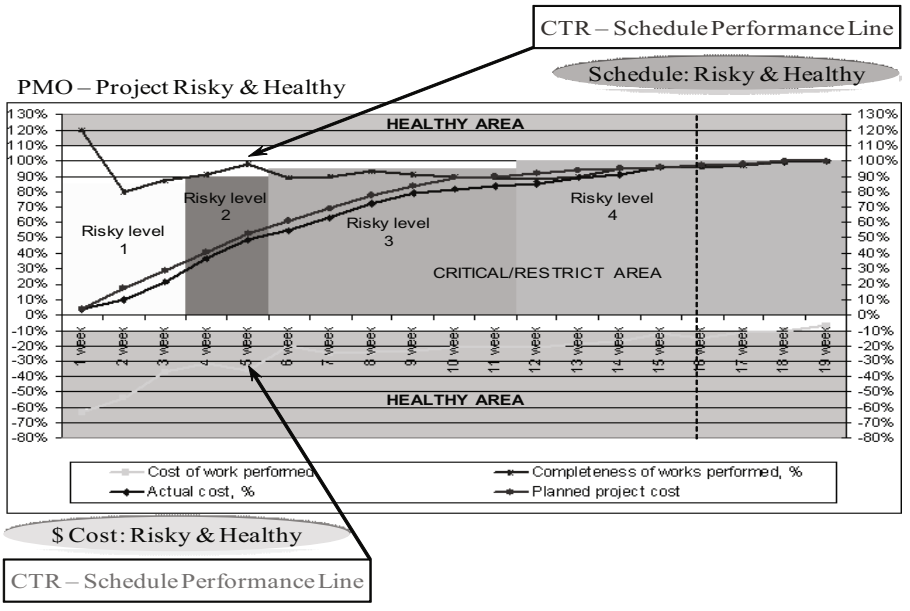


**Fig. 1**. The interaction between the project budget, schedule and CTR method. *Source*: Aramvareekul, Seider, 2006.

to a complicated Cost-Time-Risk Diagram which allows to clearly determine the actual cost value [4]. This is illustrated in figure 1:

As it is seen in the figure, two main functions are drawn which respectively are (a) a degree of completeness of works scheduled in every evaluation period (schedule performance line, CTR-S), expressed in percentage (%) and (b) the sum of cost compatible to budget scheduled if ever evaluation period expressed in percentage (%) (Cost performance, CTR-C). Both of these functions are attributed to three comparison indexes of activity, budget plan and results achieved. According to these data, CTR diagram is divided into two main fields- safety zone and danger zone, in which project cost (lower function) and works planned and performed in the project (upper function) are reflected. These zones differ dependently on the period of time that is whether in the initial or final stage of the project. When project activities are soon to be finished, even marginal deviations (just of the few percents) from the schedule can get into the risk zone.

In many cases, the diagrams of project implementation (example in the picture) involve a graphic depiction of company's tasks and their correlation [25]. According to Amar, Berman, Amornsawadwatana [2], Cost-Time-Risk Diagrams allow to reveal a connection between cost and time related to the possible risks. This method can become an effective medium to project managers when determining the deviations of project implementation in time and planning the performance of budget [2].

## 4 A Research and Analysis of Application of Project Management Methods in Lithuanian Companies

The principles of project management involve not only organizational solutions [22], but also financial resource management, relating them with strict and constantly controlled distribution of cost. Since direct application of western management theories under Lithuanian circumstances is partially methodologically risky, because the acceptability of such theories is not secured [24], the empirical research was made (questionnaires) the aim of which is to ascertain whether the implementation of project management methods is relevant in our country.

**Scope of research.** According to the data from department of statistics[1], the innovation implementation in Lithuanian companies is distributed irregularly and major part of companies is in the three largest regions of Vilnius, Kaunas and Klaipėda. Because of the easiest accessible information, 69 public companies which, according to the data from department of statistics, were registered in Kaunas region and performed their activity in the beginning of 2008 were chosen.

In order to get the results of 95% of reliability, the amount of respondents needed was calculated in concordance with Paiotto formula:

$$n = 1/(\Delta 2+1/N). \quad (1)$$

where $\Delta$ is a fixed value varying dependently on the needed reliability of result, in this case $\Delta$= 0,05;

N- The general value of totality, in the case of the research 69.

Having done the calculations, the initial scope was obtained:

$$N=1/(\Delta^2+1/N)= 1/(0{,}05^2+1/65)= 56 \quad (2)$$

Thus, in this research, the questionnaires were sent via e-mail to 56 companies in Kaunas region. From 56 questionnaires sent via e-mail, 51 were filled in properly, what constitutes 91% of sent questionnaires. It is important to pay attention to the results of the research allow to analyze the received information by quantitative method and to draw the conclusion only about questioned respondents. The data of quantitative analysis can not be treated as representative on Lithuanian scale. The results only reveal the possible tendencies.

When making a questionnaire for the research, in some questions respondents are asked to evaluate the importance of given statements that is attitude towards a particular phenomenon. The answers were evaluated according to Likert scale. Analyzing data with the help of Likert scales, each evaluation was given the expression in numbers, what helped to determine positive or negative attitude towards the subject or phenomenon being researched and arithmetical average of the results (evaluations) which reflect a general attitude of respondents.

[1] Department of Statistics. Access via internet: <www.stat.gov.lt>

The questionnaire is divided into two main groups: (1) with the first group of questions it is sought to ascertain how often the principles of project management are used in Lithuanian companies and how this implementation is related to European Union funding, (2) with the second group of questions it is sought to determine the cost planning, budgeting, success and risk evaluation methods in the companies implementing the principles of project management. Because the aim of this paper is to analyze the application of project management methods in Lithuanian companies, the second part of the questionnaire will be analyzed further on:

**The determination of Cost planning and control methods in Lithuanian companies**

Oke, Charles-Owaba [18] notices that companies often form their cost planning methods by themselves on the basis of Gantt and PERT, so there is a possibility for the companies to answer "other" and tell in detail what systems and methods they applied to calculate cost. In order to reveal the control systems for cost planning more accurately, next question is related to the use of these methods. All the companies in accordance with activity type use Gantt method most often that is 78% companies (40); significantly more rare is PERT method, it is only used by 41% respondents (21); other methods are used by 22% companies (11) in Kaunas region. The results of the research done by Oke, Charles-Owaba [18] confirm this and reveal that in man cases companies use all the methods together, applying various software to plan and control the cost for separate projects. The results also revealed that PERT method was not used separately as cost planning and control method. This can be related to many reasons: lack of knowledge, imperfection of software or lack of knowledge using IT technologies and that.

**Economical-financial methods for project evaluation in Lithuanian companies.** Dedi, Orsag [7] studying economical-financial methods for project evaluation has determined that the main methods are of: (a) Net present value (NPV), (b) internal rate of profit value, (c) project payback period. In practice, the companies having determined the cost ad income of initiated project, evaluate its benefit by economical-financial methods which, according to American Strategic Management Institute (2006), is a rational method to choose an optimal decision when determining perspective projects. In the questionnaire, economical-financial methods for project evaluation, most often written down in scientific literature [9], [7] are given.

From 51 companies which participated in the research, 90% (46) use "income and cost analysis" method for project management, 92% (47% –"project payback period" method, 75% (38)- "net present value" (NPV) method and "internal rate of benefit" method is used by 69% companies (35). Analyzing the economical-financial methods for project management being applied in practice, according to Graham, Harvey [9], Dedi, Orsag, [7], a bigger part of project managers in American companies use Net present value (NPV) method (76%) and internal rate of return value (IRR) (75%) methods, comparing them to project payback period method (56%) [9], which is more popular in European countries. The authors studying scientific literature emphasizes that research results in many European countries revealed that one of the most popular economical-financial methods for financial evaluation in Europe is payback period method, which is used by 63% project managers in Great Britain, 76% in Finland and 61% in Germany. However Net present value (NPV) and Internal rate of return value (IRR)

methods are used more rarely in Europe than in America. Respectively, 43% companies in Great Britain, 52% in Sweden and 45% in Germany evaluates their projects using net present value (NPV) method; and an internal rate of return value method is used b 57% companies in Great Britain, 23% in Sweden and 36% in Germany.

**A comparison between planned and actual cost.** According to Christensen, [5], Marshal [16], a company's risk controlled with earned value method involves many areas in project activities related to (1) project organization, (2) cost planning and budgeting, (3) project accounting, (4) complete project analysis and control, (5) timely identification of mistakes and its correction. Due to this reason, a large part of the companies operating in western countries not only calculate and compare (a) budgeted cost of work performed with (b) actual cost of work performed and (c) planned budget cost at the moment of evaluation, but also draw diagrams of indexes mentioned. This encouraged to give question i the questionnaire related to diagram drawing. Since Christensen [5] reveals that companies could draw diagrams in some projects and do not do so in smaller projects, the opportunity to answer "partially" is left to respondents, which would deny or confirm Christensen's [5] statement.

It could be stated that budget planning and performing involve process of information analysis related to project financial resources. This process includes planned cost and income of actually performed work. In the case studied, project cost is actualized by distributing them into budgeted cost of work performed; actual cost of work performed and planned budget cost at the moment of evaluation:

**Table 1.** A planned calculation of frequency of budgeted cost of work performed, actual cost of work performed and planed budget cost at the moment of evaluation in Lithuanian companies

| **Statement** | Index estimation | |
|---|---|---|
| | Arithmetical average of evaluation | Standard deviation |
| Budgeted cost of work performed or project value | 5,67 | 1,69 |
| Actual cost of work performed or actual project cost | 6,11 | 1,43 |
| Planned budget cost at the moment of evaluation or project earned value cost | 4,67 | 2,23 |

In the table, respondent companies' averages of answers are given, which show if these companies estimate indexes of budgeted cost of work performed, actual cost of work performed and planned budget cost. As it is seen from the table, the evaluation of these indexes, even if they are estimated, show that it is not done by every company in Lithuania. In most cases, actual cost of work performed is estimated (a.a. 6.11), and in most rare cases planned budgeted cost at the moment of evaluation is estimated (a.a. 4,67).

Companies which implement the principles of project management only in the activities funded by European Union do not estimate these indexes. Because Anbari [3], Aramvareekul, Seider, [4] and Marshall [16] suggest to compare these indexes by drawing earned value and time diagrams, which allow to evaluate the risk of project

implementation, related to cost and time, graphically, this question was also given to participants. Only 14% (7) of companies draw earned value and time diagrams, 51% (26) draw them partially that is use graphic evaluation methods created in their company and 35% (18) do not draw diagrams at all.

## 5 Conclusions

Analyzing scientific literature, limitation theory was distinguished, which principles state that in all the processes of project management, cost has to be constantly controlled and analyzed by using company's limited financial resources. By analyzing scientific literature it was also revealed that not only budgeting is important, but also a constant budget control as well. Analyzing the project management methods, the methods analyzed mostly by the foreign authors were distinguished at theoretical level. In the paper were analyzed the multiple methods for project management of (a) budgeted cost of work performed, (b) actual cost of work performed, (c) planned budget cost at the moment of evaluation. With the help of these methods, companies applying the principles of project management, can evaluate budget, follow its implementation efficiency, reduce the risk to exceed budget and to deviate from the schedule.

In order to do an empirical research, a questionnaire was formulated; by which witch the implementation tendencies of project principles in Lithuania are revealed.

In order to evaluate how the principles of project management are implemented in Lithuanian companies, 51 average and small public companies were questioned (scope is based on Paniotto formula):

In public companies, when planning and controlling financial resource management, Gantt method is used most often (78%), which is a practical analytical medium, because it gives view of all project activities with elaborated periods of time, what facilitates the determination of necessary resources and periods of time, controls and plans the costs. However, large part of companies, dividing their activity into projects, have answered that when analyzing their project cost, they use Gantt and Pert methods together;

For the economical and financial evaluation of the project, many participated companies use „project payback period" (92%) and „income and cost analysis" (91%) methods. In contemporary practice, the main „net present value"(75%) and „internal rate of return"(69%) methods are distinguished, which allow to evaluate the influence of inflation on project value. These current methods are applied slightly more rarely.

Companies, being researched in the context of contemporary economical situation, implementing the principles of project management, should constantly follow and identify the tendencies in both global and local market changes, determining the possible risk which reduces the usefulness of project to a company.

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