IMPROVE THE EFFICIENCY OF MULTI - PROJECT PORTFOLIO MANAGEMENT. CASE STUDY FOR THE ENERGY SECTOR

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Abstract

This paper highlights the results obtained during the doctoral research carried out in case of multi project Engineering, Procurement, Construction, Commissioning (EPCC) investment types. The goal of the conducted research was to improve the project portfolio management. The main result of our original research presented in this paper was the highlight of the needed steps for achieving a multi project efficient methodology and the clearly reveal of the opportunity offered by implementing such system in a multi project complex EPCC investment program. The results of this study showed that this approach will provide a performing working environment, able to sustain the management team in identifying the investment program criticalities and congestion points in order to be able to manage them in an efficient manner in order to assure the reach of the investment goal.

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Keywords

Multi Project Management, Efficiency, Project Management, Portfolio Management.

JEL Classification

M1

Introduction

In the current economic context, new tendencies in investments field were identified, as reaction to the condensed increased demand of standardized products on the global market (Sandru et al., 2014). So it was build the frame for developing mega projects (Killen et al., 2012).

Projects shall not be seen as individual entities. In present business environment, effective management of the entire project portfolio has become mandatory for achieving the expected performance targets. The most important phase in project portfolio management is the front end of projects with focus on business analysis and studies. This is in particular most important by its capability to generate new opportunities, ideas and strategies, and so the basis for later project, portfolio and corporate success is set (Heising, 2012).

According to Kaiser et al. (2015) project portfolio management represents also a commonly employed technique to align a project portfolio with strategic goals.

Project management processes are in direct correlation with organizational environment, therefore the forming training and coaching of the new project managers shall take in consideration the potential effect of organizational change on the successfully completion of the projects (Hornstein, 2015).
Mega projects by them size and complexity changed the paradigm in managing them. It is not possible to manage such project as a single project. Therefore, there were developed management tools and instruments able to offer the capability to manage the entire portfolio of projects grouped in an investment program by not losing the advantages offered by a centralized model. The stake is significant; it is common for such investments programs to overpass in energy field budgets of over 10 billion USD.
Project risk management is important and certainly lead to project success. It should be noted that current risk management tools do not have such a predictive ability to indicate any potential risks that may appear before starting a project (Yim et al., 2015).
Following these, a new tendency was identified in such projects due to the fact that the project owner wants to involve himself in managing the investment program for obtaining a maximum benefit. Classical contract approach with a general contractor on a lump sum contract starts to be overdue by new contracting approach on reimbursable typology contracts managed by project owner team (Sandru et al., 2014).
This means that the possible low performance risks but also the potential benefits that can result are targeted by the project owner team. The project management principles are in their essence the same in case of portfolios or individual projects (Schwindt and Zimmermann, 2015). These reflect in the necessity of continuous adjustments according to the organizations goals for building a rigorous management system taking into account all disciplines driven projects from the portfolio in order to optimize their results by an efficient progress monitoring and resources management (Cleland and Gareis, 2006).

1.1 Current approaches in gaining portfolio management efficiency

Given the growing number of projects in a company, it is very important for the efficient administration and management of these to be structured in a project portfolio for the effectively strategic alignment. In terms of project portfolios with product delivery and customer service, these involve a strong connection between a project portfolio management and increased customer focus (Voss, 2012).
There must exist to the organization level a clear connection between outputs created by the project and the company's business strategy in order to create optimal value of the investment in projects (Weaver and Too, 2014). The purpose of EPCC investment program type is complex. Thus it can be structured in 4 main phases driven from the disciplines: Engineering, Procurement, Construction and Commissioning.
As response to the concurrent market, the contractors are forced to specialized themselves in certain phases and disciplines, contractors with overall skills mainly they are competitive in none. As follow in order to cover the entire investment program scope, the contractor shall contract services by phase and discipline (O'Brien and Plotnick, 2010). I.E for engineering, construction and even commissioning part, we will have different contractors specialized in different areas such as civil works, piping, steel structures, electrical works etc. The procurement part is mainly and usually covered by the project owner team. Due to the significant number of variables by having the overall scope grouped by phases and disciplines with its own specialized contractors, with individual contractual scopes and schedules the project management team is mainly focused on present phase activities

considering in a mistaken way that the overlaps are insignificant and not relevant for the overall investment program.
For an optimized integrated approach focused on the earliest possible start of each phase and on the efficient linear assignment of resources it is needed the support of modern technologies capable to calculate and summarize the information's produced by the new integrated management approach (Olaru et al., 2014).

1.2 Applying project management concepts and steps in case of project portfolio

An investment program is actually at a macro level comparable with a unitary project. The single difference consist that a unitary single project may be treated as an overall by being defined through its own activities assigned to the unique Work Breakdown Structure (WBS). In the same way at a portfolio level, the individually projects, shall be treated as investments chapters, WBS structures, in order to achieve the completion objectives (Lewis, 2002).
So, it naturally appears the question: When should we, as project owner team start to integrate the investment projects?
In the common practice as evidenced through this research the project owner team starts the integration process in the construction phase. This approach is not the optimum one. The process of integration the investment frame, shall be started at the earliest moment possible of the investment program. For doing that the investment scope shall be complete and clear defined (Sandru and Olaru, 2013).
The next step is to develop the work strategy and roles. In this stage it should be agreed the working methodology. It shall be defined if it will be used a general contractor or not and how will be split the overall scope of works. Following those two initial steps the entire project owner team will be build, in order to manage the portfolio according to established strategy. In what concerns portfolio of projects it requires more than integration of the individual projects to obtain maximum performance.
Each project has its part, both constraints and their own performance indicators. The management team shall be continuously in the position to coordinate those to obtain an optimal at the overall portfolio level (Sandru et al., 2014).
Therefore integrated summarized analysis is needed for support to overall critical path analysis, overall S-Curves and progress analysis and overall Earned Value and performance analysis. Those tools are needed by the management team for assuring the reach of performance targets.

2. Research methodology applied for analyzing and defining a performance portfolio management frame

The methodology used in case of the present research detailed in this paper is focused on the practical experience and analysis of the authors related to portfolio investment programs in energy sector. In order to define the models, the management methodologies and tools, several research activities were fulfilled.

- Documenting referring to multi project management, performance analysis, critical paths analysis, extension of time claims procedures;
- Practical implement of presented concepts in different project portfolio, EPCC investment program types as member of the management team;
- Consulting active contractors during the coordination meetings focusing on project controlling and performance analysis;
- Validation and tuning of the implemented concepts in active investment programs.

Duet to the unique character of investment programs the project portfolios are very different. Therefore the management team shall adapt and develop for each individual investment portfolio specific and customizable tools in order to be able to optimize the chances to meet the performance completion targets.

3. Research results related to the applicability of management tools to improve the efficiency of multi – project portfolio management

Summarized reports are expected by the Management Team. Thus a satisfactory quality of the information and the reliability of these can be obtained only in a complete integrated and structured portfolio environment.

In order to be effective and to offer the necessary information for a performing management act the reports shall be in a summarized form but in the meantime to offer sufficient analyzed information. Following the above to be able to offer the needed overall information our research pointed several criteria that are needed related to the investment portfolio integrated schedule:

- To cover all the logic driven from the constructability reviews and start-up sequences;
- To include all the engineering, procurement, construction and commissioning events, accomplishments and tasks to project completion;
- Build-in logic between the different component distinctive Schedules at activity (Milestones and/or Tasks) level;
- To contain measurable tasks by quantities; to facilitate the updates based on the data inputs from Contractors;
- To be configurable and able to offer different levels of combined reports from timing quantities and MHRS (Man-hours) perspective by lots, areas, contractors, disciplines, units, systems and subsystems;
- To be able to offer the information in different levels of summarization;
- The names of accomplishments and tasks should be descriptive, concise and specific to the program.

Once having meet the Investment program schedule needed criteria, several high impacting summarized reports can be developed. Very important in generating summarized reports is the weighting system. During our research it was concluded that the most trustfully weighting system for the activities is based on quantities transformed by a productivity ratio in equivalent MHRS. This approach is most effective when the completion performance milestones are time related.

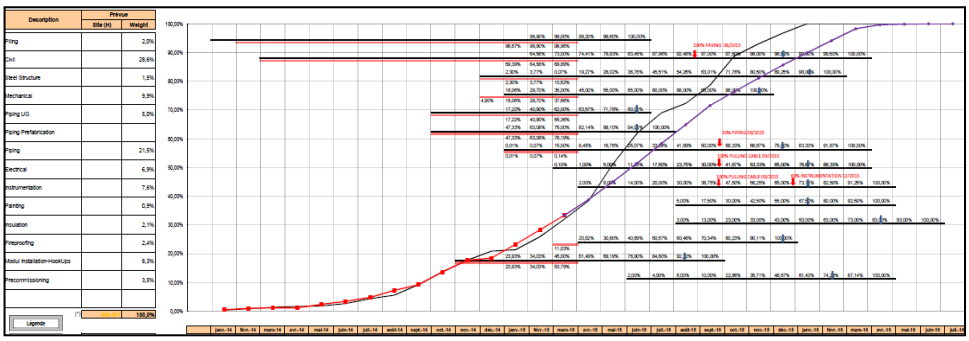

Fig. no.2 Overall weighted portfolio S-Curve

Source: according to the study conducted by the authors

3.1. Overall S-Curves

The most common and frequently used reports in Portfolio Project management are the S-Curves. A very sensitive point in developing the overall S-Curves is the weighting factors which contribute to the overall figures (Fig.no.2).

In the above graph are on the X-vertical axis the percentages from 0 to 100% and on the Y-horizontal axis the time period (months) to completion. In addition in the presented S-Curve report were included also the weighting summarized at discipline level as well as significant milestones.

3.2. Overall Critical Path and Critical Path Length Index (CPLI)

The Critical Path represents the logic chain of driving interrelated activities, tasks and/or milestones which forecast the completion date. Its length is represented in the time window (number of days/hours) to the early finish date of milestone representing investment program completion (Schwindt and Zimmermann, 2015). The conducted research pointed the importance of the overall critical path resulted from the projects integration in a portfolio. Without an overall critical path, the portfolio completion milestones dates are not reliable; these can be only estimated. The overall Critical Path is not resulted from the sum of the distinct separate projects Critical Paths, it result after the integration and point the Investment program completion date (Fig.no.3).

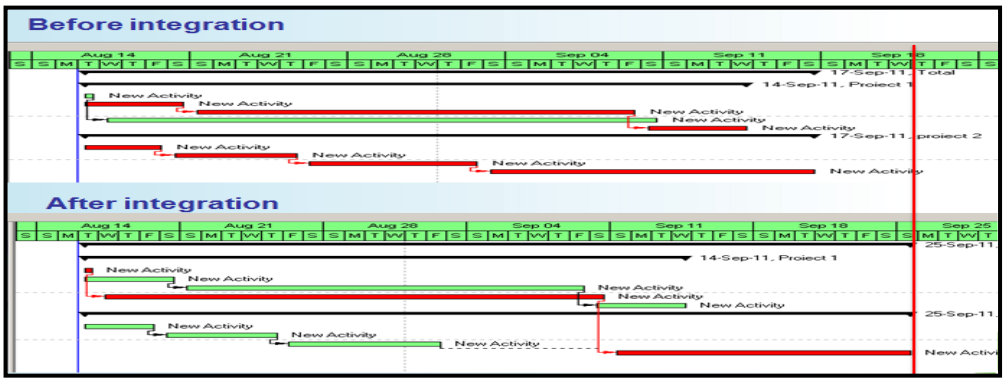

Fig. no. 3 The results of project integration on Critical Path
Source: adapted from Sandru M. and Olaru M., 2013, pg.440.

The CPLI (Critical Path Length Index) is a very efficient instrument for establishing the criticality from timing perspective of the investment program. This coefficient can be applied only after the validation of the complete integration of the portfolio schedules on a reliable overall critical path and is calculated as (see Formula (1)):

CPLI = (Critical Path Length + Total Float) /Critical Path Length (1)

The resulted value is KPI which indicate the ratio of Total Float versus the remaining duration of the overall Critical Path. I.e 10 days Total Float on a Critical Path with 50 days remaining duration will give a CPLI of 1.2 showing a manageable risk on timely completion date achievement. If the Critical Path has a remaining duration of 500 days the CPLI will indicate a value of 1.02 although above the targeted value 1 will show a significant bigger risk related to the timely completion date. Therefore we can state that the CPLI indicate the relative efficiency needed in order to achieve in time the completion milestone.

3.3. Baseline Execution Index (BEI)

Baseline Execution Index (BEI) indicates the number of completed activities as a ratio to the planned activities for the specific period according to the saved referential (Baseline Schedule).
Although this methodology is well appreciated by the management team, in order to be a reliable and trustfully analysis it involves that the detailed schedule activities to be in the same range of weighting. Big discrepancies in weights will offer confusing results that will induce false conclusions.
The results of the conducted research shown the limitation of such indexes by not taking into account the relative weight of the activity, into the entire as detailed in this paper. Therefore the authors are proposing that those indexes to be weighted as (see Formula (2) and (3)):

$$BEI = \frac{\text{Tasks Actually Completed}}{\text{Tasks Planned to be Completed}} \quad (2)$$

where, BEI = Baseline Execution Index

$$wBEI = \frac{\text{Tasks Actually Completed}}{\text{Tasks Planned to be Completed}} \times \frac{\text{Actual Labour Units}}{\text{Planned Labour Units}} \quad (3)$$

where, wBEI = Weighted BEI

wBEI synthetic measuring KPI reflect the approach of the execution in comparing with the initial planned number of activities and their weight. Resulted figures are compared with 1 which indicate that the "As Build" follows accurately the as "As Planned", figures above 1 indicate accelerations in comparing with the planned number of activities and quantities in equivalent MHRS, values lover than 1 indicate that less number of activities and quantities in equivalent MHRS were completed.
During the conducted research and consulting activities the authors have shown the limitations of this indicator and proposed to be used in concordance with adjusting weighting factors based on planned/executed Man-hours (MHRS) and budgeted costs, as detailed above.

3.4 Milestones Tracking Tables and Reports

As above detailed the IMS (Integrated Master Schedule) is considered the time phased schedule built on the logic of interactions criteria of main events and tasks at the portfolio level. An activity in the IMS must have expected duration and resource requirements according to the source data at the individual separate project schedule level. The IMS will be built by identifying and including the logic of Lot Schedules interrelationships through the main events (Milestones and Tasks) resulted from the Process and Commissioning sequences. Thus for simplifying the summarized reporting for progress tracking main key events at the portfolio level can be set up and analyzed. Milestone reporting is addressed to the high management levels. Those reports offering only an overall helicopter view (Fig.no.4).
The Milestones main events are considered key points at the Lot individual Schedule or IMS level which indicates a level of the progress achieved e.g. First/Last PO placed, ROS, Site availability, ISO's IFC, System/Subsystem Mechanical Completion etc.

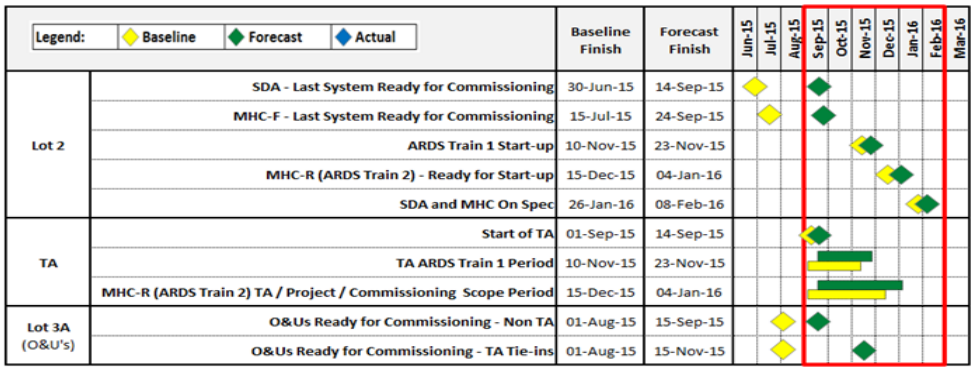

Fig. no. 4 Milestone reporting in portfolio investments from energy field
Source: according to the study conducted by the authors

For the management team a good and accurate track of those milestones guaranties the completion of the investment program in the assumed performance targets (Fig.no.4).

4. Conclusions

The results of the research conducted by authors shown that the procedural approach and method statement of portfolio management and investment programs are a high interest topic for project management specialists.
Although in the literature is significant documentation related to the portfolio management, case studies and practical methodologies are very few do to the particularities of each investment portfolio. Thus, well-defined methodologies and techniques for project management are in place. Starting from these can be developed performing integrated management systems once the strategies and objectives were defined. Also be noted that applying the procedural approach resulted from our research can address in a more focused and reliable investment portfolio planning and progress measurement system. On the other hand, the result of the research demonstrated that the designing and planning of the portfolio investment frame and strategy have a major role in optimizing the investment program.
These results shall be considered a starting point for future research to optimize the portfolio and investment programs management methodologies on today's market being a gap of experience and knowledge in this area.

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