TRANSPORTATION PROJECT PERFORMANCE MANAGEMENT

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ABSTRACT

This paper deals with the performance management of transportation projects. In this regard, it proposes a performance management system through which the information and standards arising from transportation projects undergo a series of steps in which this information is measured, fed back and assessed, allowing the detection and communication of deviations and the implementation of corrective and improvement actions.

Keywords: Transportation Project, Performance Management, Project Control.

1. INTRODUCTION

Transportation systems are key factors for increasing wealth and development of a society. Besides being important production elements, they enable people's access to education, work and leisure.

Factors such as population growth and economic development boost the demand for transport of people and cargo, making it necessary to expand the transport infrastructure, which is typically implemented through projects. Thus, transportation projects are usually related to the expansion and improvement of transport infrastructure networks.

“Transportation project management, for all modes of transportation, is under extreme budgetary, political, and community pressure to contain costs and improve efficiency in the delivery of projects ‘on time and on budget.’ In order to meet these twin goals, transportation agencies must employ dynamic project management tools. The successful planning, design and implementation of
Transportation projects needs to meet various performance metrics depending on each stakeholder’s perspective.” [8]

Transportation project performance management encompasses two major issues: the first is monitoring and control, aimed at detecting if the project runs according to plan; the second is improvement, whose goal is to improve the processes performance, regarding primarily efficiency, efficacy and effectiveness.

“Performance measurement systems are made to trigger corrective actions and hence serve as early warning systems to generate signals when the desired performance drops below a certain predefined management threshold”.[16]

Different issues from the monitoring and controlling of projects have been described in literature ([6]; [11]; [14]; [15])

According to [3], project control includes four elements: the performance standards and plans, the performance-measurement techniques, a comparison of the planned and actual performances, the corrective action.

Therefore, it is extremely important the continued monitoring of transportation projects, comparing the actual and planned performances, pointing out deviations, ensuring that the performance is as close to plan as possible.

“Control is also essential to determine the extent of the results achieved, the efficiency and productivity obtained implementing programs, and the degree of compliance with orders and instructions, as well as to minimize waste of manpower, materials, time, other inputs eventually required, and, therefore, money.” [7]

Also, effective control can provide a quick response as soon as a deviation is detected, allowing the correction of failures or changes in planning, allocating resources, changing the duration of the activity, or other actions, in order to achieve the project goals.

However, according to [4] “Project-control systems are adequate for the identification of deviations from project plans, but not adequate for helping the project managers to diagnose the cause of the deviation or to devise a suitable corrective strategy. In other words, common project-control systems focus on standards development, performance measurement, and the comparison of planned and actual performances, and they ignore corrective action.”

In the proposed system the concepts of control and performance improvement are closely related to the concept of variability.

The processes that characterize transportation projects are full of variations due to factors that compose them. These variations are basically of two types: those intrinsic to the processes, which are natural variations, expected to occur as a result of the context in which the factors are used; and those extrinsic to the processes, which are exceptional variations, of unexpected and random occurrence, which deviate processes from its natural state of functioning.

Thus, while the primary purpose of control is to detect the occurrence of extrinsic, external variations in order to correct its causes, the goal of performance improvement is to act primarily on the intrinsic, innate variations through management actions which allow the evolution of processes and, consequently, of the enterprise as a whole.

2. TRANSPORTATION PROJECT PERFORMANCE MANAGEMENT SYSTEM

The main goals of the proposed performance management system are the detection of deviations and implementation of corrective solutions, the review of goals, and performance improvement.

To this effect, the system consists of five steps: measurement, feedback, assessment, communication of deviations, and implementation of corrective and improvement actions.
Figure 1 summarizes the proposed performance management system.
2.1. Measurement

Measurement is the basic tool for performance management, as it collects and treats the necessary information for analysis. It consists of three steps: defining the scope of measurement, data collection and processing data.

When defining the scope of the measurement, it should be defined what to measure, how much to measure, and when to measure.

What to measure can be time, cost, quantity, quality, or any other variable, that directs focus only to the truly important elements for the control and assessment process. Monitored information usually concern data on Scope, Time, Cost, Quality, Human Resource, Communications, Risk, Procurement, Stakeholder and Integration of project actions.

How much to measure implies defining the scope of measurement, being a function between its cost and the level of detail in which the analysis will be performed.

When to measure defines the ideal time for the measurement, which can be during the period of occurrence or at its end. Measuring during the period of occurrence offers the advantage of being able to make corrections before the end of the operations. The cost of measurement during intermediate stages of the process, however, may prove to be more costly than in the final stage, being the best procedure based on a cost-benefit analysis.

In data collection, three factors should be considered:

- the level of accuracy with which they should be collected according to the type of analysis and the characteristics of the work process;
- the tools needed to collect the data, including not only the adequacy of the measurement instruments themselves, but also the collection forms;
- the training of the involved personnel regarding their ability to understand the data collection goal and system, and to use the tools and fill out the forms properly.

In data processing, the information collected is treated to make them suitable for the goals of measurement.

2.2. Communication of Information

After properly processed, the data must be sent to where the analysis will be carried out, which means defining the data destination, the frequency in which it will be sent, and the mechanisms to be used to communicate it.

Regarding the destination, the information shall be sent to top and middle management, advisory units, supervision, and assessed personnel.

Regarding frequency, the information must be sent in time intervals that allow the analysis and maturation of previously sent data. According to Hampton (1973), "the frequency of feedback imposes a more delicate problem. Despite the general desire to feedback frequently, it is possible to provide it even more often. Every job or task tends to require the passage of a certain period of time between its implementation and its results. This period, sometimes called the prudence interval, can be longer for high-level jobs than for low-level. Feedback tends to lose its validity and credibility if it reflects a prematurely measured performance."

Regarding mechanisms, they must be agile and in an appropriate language to those who will use it. We recommend the use of audiovisual reports and devices.

2.3. Assessment

Assessment is essentially a comparison activity. It is by comparing the data obtained from the previous step, with pre-established standards, that the evaluator gets an insight into the process variability in order to draw conclusions about it.

The establishment of standards typically begins during the planning of the actions to be
performed; so the plans, in addition to containing how the actions should be carried out, should also indicate the expected standards of performance, which does not prevent, at the performance management, that other information that may appear relevant to be collected and assessed. The standards normally considered are those related to the Scope, Time, Cost, Quality, Human Resource, Communications, Risk, Procurement, Stakeholder and Integration of project actions.

Figure 2 presents the process of establishing standards.

![Diagram of standards establishment process]

**Figure 2 - Establishment of standards process**

The need for decision making normally occurs at two situations: the first one is where there is the need for immediate solution for a problem, and the second one is where there is no emergency that requires immediate action, but rather something that can be improved. Hampton (1983).

In both cases, the core of the problem is the fact that the expected results were not achieved, i.e., deviations towards the goals were not detected.

Understanding the problem must occur on the basis of the expected results, systemically, in order to be more in line with reality. Additionally, it is important that the problem is comprehended by an approach that considers it inserted in the project context, influencing and being influenced, and not as an isolated case.
2.4. Communication of Deviations

When deviations are detected, they should be reported to their origins, so that corrective or improvement measures can be taken. For the communication of deviations, it should be defined the destination, frequency and mechanisms with which they will be reported.

It is understood that deviations should have, as far as possible, two primary destinations:

- The first one concerns the levels of the project structure whose hierarchical position allows a proper understanding of the problem as well as the necessary authority for the implementation of corrective actions;
- The second one concerns the individuals who originated deviations or are directly responsible for them. According to HAMPTON (1973), "the arguments in favor of feedback to the measured individuals themselves include the motivational benefits associated with self-control and the possibility that individuals are the best judges in deciding what to do with the information. [...] People will feel more committed in relation to the goals they have set themselves."

Regarding deviation communication frequency, it shall be appropriate to the urgency of corrective and improvement actions.

Regarding deviation communication mechanisms, as well as for the mechanisms of communication of information, they must be agile and in an appropriate language to those who will use it. We recommend the use of audiovisual reports and devices.

2.5. Implementation of Corrective and Improvement Actions

As already seen, corrective and improvement actions are associated with the type of variation found in the production process, due to inherent factors of the means of production, technology and environment.

Corrective actions concern the maintenance of quality in the construction projects processes, through actions aimed at correcting extrinsic variations that are occurring or are likely to occur, in order to eliminate or at least minimize them, preventing thus decreasing of quality of these processes over time.

Improvement actions comprise management actions aimed at reducing the intrinsic variations, thus enabling performance improvements by obtaining progressively higher results.

The meaning of the concepts of correction and improvement are closely associated with the concepts of inappropriate and appropriate. Thus, correction is an action associated with the removal of something considered inadequate when compared to pre-established standards, in order to make it suitable, correct.

Improvement, however, is an action associated with the establishment of new standards. Thus, although the system works properly (in relation to established standards), improvement actions are developed in order to make the construction companies more competitive.

Among the corrective actions stand out the actions that act on occasional problems of the process and on unpredictable behaviors that lead to unexpected results.

Among the improvement actions stand out the actions that act on chronic problems of the process and actions that lead to new, higher performance standards.

For the implementation of corrective and improvement actions, alternatives should be formulated to consider the stakeholders, the experience on the subject, and creativity.

In summary, the formulation of alternatives involves the generation of possible solutions according to pre-established standards, or solutions which are able to handle the situation at a level of performance similar or superior to that established by these standards. As the alternatives are formulated, their main consequences should be identified and added to these subjective probabilities of their occurrence when necessary, so the best solution can be reached.
3. CONCLUSIONS

The paper presented the synthesis of a transportation project performance management system, which helps companies to develop transportation projects, notably infrastructure improvement projects, to fulfill their task of producing products and services that meet the needs and desires of customers by improving the efficiency and effectiveness of processes.

The discussed management system focuses on the correction of deviations, the review of goals and objectives, and performance improvement.

A consistent process of establishment of standards is essential to the proper operation of the system. In practice, the establishment of standards typically begins during the planning of the actions to be performed; so the plans, in addition to containing how the actions should be carried out, should also indicate the expected standards of performance.

The transportation project performance management system must be properly integrated into the business performance management system of the companies responsible, which is usually designed to improve management, administrative and operating processes of these companies.

It is also important that, during the implementation of the system, mechanisms are developed that ensure the system understanding by all involved in performing the activities.

An important factor for the transportation project performance that deserves special attention is the performance of individuals at work, which should be analyzed under the characteristics of the work processes and the processes ability to provide the means necessary to perform the services, and also opportunities offered to workers.

Among the characteristics of the processes that may influence the performance, maybe the most important is the level of variation, due to the factors that comprise them. These variations are basically of two types: those intrinsic to the processes, which are natural variations, expected to occur as a result of the context in which the factors are used; and those extrinsic to the processes, which are exceptional variations, of unexpected and random occurrence, which deviate processes from its natural state of functioning.

The performance is also influenced by the ability of the processes to provide the means and opportunities. In this regard, there are some factors that should be considered:

a) Inherent factors of the job
   - Level of diversity: it concerns the amount of fundamental actions that the worker must perform to obtain the product or service;
   - Level of effort: it corresponds to the intensity of physical and / or mental effort needed to obtain the product or service;
   - Level of autonomy: this is the level of freedom, which is given to the employee, on how best to perform their activities;
   - Level of information: it concerns the intensity with which information about the quality and suitability of the work performed are communicated to the worker.

b) Inherent factors of the means of production, technology and environment
   - Adequacy of equipment, technology and work environment to the nature of the work;
   - Safe handling and use of the equipment;
   - Production capacity;
   - Space provided to perform the job;
   - Working environment characteristics;
   - Ambience and occupational safety;
   - Procedures and specifications that allow the workers responsible for carrying out the tasks to achieve the expected results efficiently and safely.
4. REFERENCES


