

## Research on Integration Management of Large Engineering Project based on PBS

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**Abstract.** This large scale engineering project is a complex system. How to effectively manage large engineering project is a problem at present. Firstly, this paper studies Project Breakdown Structure, and then establishes a model of integrated management for large engineering projects based on PBS and Hall three-dimensional system tool. The paper expects to realize the integration management of large engineering project. The result shows that it can effectively improve the management level and management efficiency of the project.

### Introduction

At present, the most disadvantages of project management are mainly the more benefit related parties, the life cycle of the project is so long, there are so many sub-objects that we need to realize under the overall objects, and the stakeholders consider problem on their own way because of their different views, and did not consider the system as an organic whole so that did not achieve the whole optimization [1-2].

The three dimensions structure model of Hall inspire us that we treat the project as an organization system, consider the object or elements (cost management, schedule management, quality management, contract management, resource management, risk management, safety management, human resource management, stock management) that project management related, each related stakeholders (owner, design company, construction company, supervision company, consultant company, national construction bureau, layout bureau, soil bureau, contractor, material supplier, operator, user, environment protect department, city planning department). Through the above research, we can found that if we manage the project detail excessively not only lead to expend so much cost but also not benefit for grasp the whole of the project and easily indulged in the exact details and things because the scale of the project especially the engineering project is so big[3-5]. And PBS is the best tool of project macro control and the ligament of the micro control, not only the basis of marking bid of the project, is also the tool of realizing project system breakdown[6-8]. So PBS is the basis of project synthesis integration control, build the project integration management model based on Project Breakdown Structure [9-10].

**Project Breakdown Structure** .The project can be divided into many related and independent package according to some breakdown rule and way, is the base of bidding package and is also the base of controlling the whole system. Each package included some time information, space information and elements information, that is, object, process and stakeholders. Many project packages consist of the whole project, controlled each project package equal to realized the synthesis integration control of the whole project; at the same time, because we realize the integration from the view of system integration, and that can achieved the whole system optimization, that is , project optimization. However, build the project integration management model based on Project Breakdown Structure (PBS).

Each PBS is a project package, present a project integration management control point, controlled each PBS means realized the synthesis integration control of the whole project. Each PBS included

element information (time, cost, quality, risk, safety, contract and resource and so on), space information (stakeholders) and process information of this package, in the process of controlling each project package, should synthetically consider the information of the three sides above so that realize synthesis integration control of the project package, because the project package breakdown is doing according to the breakdown principle of the system, therefore, realized the synthesis integration management of the whole project.

PBS is the ligament of project synthesis integration control management, realized project integration management of the project from the macro view. And PBS formed a project breakdown structure system in virtue of WBS, CBS, RBS, OBS and so on, this breakdown structure contact each other through PBS. Build project package in order to made PBS more practicability and more maneuverability, this project package included related information of itself, included every kind of data in this project package through information system.

**The structure system of integration management model based on PBS.** Build project integration management three dimensions model based on PBS, according to the detailed content and feature in the process of project management on the basis of three dimensions structure model of Hall. The three dimensions of this model are: time dimension, that is , process integration, gained it by project whole life cycle management, unified each phase of project management process, realized process integration, this is the integration of time dimension; space dimension: that is the integration of the stakeholders, unified all of the stakeholders that project related, realized integration management, this is the space integration; object dimension, that is elements integration, there are so many elements of the project, divided project elements into cost management, schedule management, quality management, contract management, resource management, risk management, safety management, human resource management, stock management according to PMBOK class, realized synthesis integration control of object element that originally single managed. The integration of the three dimensions is related by PBS.

Formed PBS and project code system through break down the project systematically, united the three dimensions of project integration management by management information system through the whole life cycle process management of the project time dimension, the project stakeholders integration management of space dimension, elements integration management of object dimension project management, realized the project integration management three dimensions model structure system based on PBS.

**Elements integration.** Elements integration is object dimension integration, is the integration of nine objects management of project management in object dimension.

Management object are so many in project management, there are mainly project cost management, schedule management, quality management, contract management, resource management, risk management, safety management, human resource management, stock management and so on. In American PMBOK, it divided project management into nine: project integration management, project scope management, project time management, project cost management, project quality management, project human resource management, project communication management, project risk management, project stock management. Combined the practice of China's project management and project engineering, the paper decide to adopt cost management, schedule management, quality management, contract management, resource management, risk management, safety management, human resource management, stock management as the object elements of project management, and the integration management is realized by the eight management before going.

In the past project management, manager generally controlled the single management object, such as schedule management, quality management, cost management; afterward, develop to synthetically manage the two elements of project management, such as value added management. Realized the management and control of the project through synthetically considering the two elements-schedule and cost. The single element or double elements management just realized partly optimization, did

not consider the project as a system, the change of one element will lead changes of other elements. Therefore, the element integration of project integration management manages the object elements of project management as a whole so that achieved the whole optimization of the project system from the view of the system.

**Process integration.** Process integration is the integration management of the whole life cycle of project, is the integration of the project in time dimension.

Because project needs some process to finish, it is also suffer long time for engineering project. Therefore, project management is also a process. In the past, the processes of project are separated, decision, implementation, operation of the project are charged by different people. Especially in engineering project management, the prophase decision of the project are charged by owner or contract company, such as the research of investment chance of the project, feasible research and so on; the design of the project is consigned to the aptitude design company; the construction of the project is constructed by the contractor through bidding; the operation of the project or the anaphase is charged by the owner or the client.

It is easy to see that the whole process of the project is managed by different companies, if each company did not communication each other, there will be easy to information isolated island phenomenon, this will caused the following situation: final accounts over equal budget, the budget over equal the approximate calculate, the approximate calculate over equal estimate, these will do not avail to control the project investment. In the process of project construction, there are wrangle and waste situation because the contractor and disport party are not harmony each other, and this will also do not avail to control the project construction cost.

If the stakeholders can get the project cooperation information to communicate in the whole process, this will optimize each management elements such as the cost, quality, and schedule of the project. For example, in the design phase, the project contractor, material supplier, operator take part in the project design, this can greatly save the project cost, realized the control of the project investment. The operator and user of the project take part in the construction process in the process of project construction.

As for the process of the project, there are different phase partitions. The paper divided the project process into prophase decision, plan design, operation, implementation based on the partition way that used by other people.

The project has the cycle; we cannot separate each process to manage, should look the project process as a whole, consider the project process as a life cycle, and manage the project by the whole life cycle. In this way, realized the project process integration management, organically unified each phase. As for the product project, we can also adopt multi-life cycle management, realized the multi-life management with the updating and exchange of the product.

**Stakeholder integration.** Stakeholder integration is the space integration. These are the integration of benefit related party in the space dimension, such as owner, design company, construction company, supervise company, consultant company, national construction bureau, planning bureau, soil bureau, contractor, material supplier, operator, user, environment protection department, city planning department.

The decision, implementation, operation of the project is complex process, therefore, project management related to so many stakeholders, the stakeholders of engineering project management related are: owner, design company, construction company, supervise company, consultant company, national construction bureau, planning bureau, soil bureau, contractor, material supplier, operator, user, environment protect department, city planning department and so on. The relation between is the equal contract relation, or the client-deputize relation, or manage and managed relation, or supervise and supervised relation and so on, they constraint each other by contract, law, statute.

However, stakeholders often lack a benefit cooperation institution or mechanism, they often related between two, and less related more than two parties. Actually, from the view of system theory, only consider the stakeholders from the whole, be can maximum the whole benefit.

## Conclusions

The paper introduces system engineering three dimensions structure system of Hall, and then put forward to project management integration model based on PBS, this model included three dimensions: time dimension, space dimension and efficiency dimension, that is elements integration, process integration and stakeholders integration. Following, introduced the detailed contents of three dimensions integration and support condition of project integration management: organization integration, information integration and function integration.

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