The Research of Wind Power Project Company’s Engineering Management System

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Abstract. By analyzing the process of construction engineering management of Wind power project company, we can abstract the core professional work, which includes budgets, bits, contracts, schedules, quality, safety, finance, machine management and more contents. Combined with the organizational structure of project companies, linked with the process of core professional work, to design the hardware and software structure of construction engineering management system.

1. Background of Research
Wind power project company is in charge of the entire process of engineering construction, and handing over to the operation company to manage after the construction is completed. Wind power construction project has contrastive characteristics in areas such as the short period of construction, and strong intensity in construction at its height. While there are differences in every single condition in the sections of equipment transportation, basic construction, and installed fields. Meanwhile, wind power fields project construction has a great level of similarity and resemblance in tender, civil engineering, and mechanical-electrical equipment installations. It contains some characteristics of big industries’ assembly lines, and has qualified to proceed standardize management of wind power fields. Thus, it needs engineering management system to supplement the entire construction process of wind power construction projects, and tightly integrate every part of the construction process, to achieve the destination of zero-waiting working process, zero mistake installations, and zero-wasting goods. By accumulating the data of the operation period when the engineering management system is built, we can achieve the Duplex Handover goal of transferring real engineering and digital engineering.

2. System Functions
To investigate the core business, wind power project management system at least contains core section of links of construction management besides its own system management. For example, it contains the basic information of the project, budgetary estimate management, tender management, contract management, schedule management, quality management, safety management, document management, financial management, mechanical-electrical equipment management and etcetera.

Basic information of projects contains project code, project name, construction time, expecting completion time, construction address, management unit, scale and etcetera.
Budgetary Estimate Management contains inputting budget design, available of importing through excel sheets, accomplishing the query of budget design; inputting and executing the budget, available of importing through excel sheets, and accomplishing the query of budget.

Tender Management is to accomplish the unified management of any tender businesses of the company, and to accomplish the management of the entire process of tenders, what includes the work out of tender files, recording the tender process and managing the evaluating process, meanwhile, it can be supportable of business processes like seeking tender winning information and etcetera.

Contract Management mainly contains safeguarding the contracts' basic information, signing the contracts, changes and claims during the contracts executing process, statements and payments of the contracts and etcetera.

Schedule Management contains milestone plans of engineering construction, work out of the whole process of construction plans, and work out of year-progress of construction plans.

Quality Management is to build up quality management system, and to ensure the regular operation of quality management system; to summarize and count the engineering project's quality conditions, and input the events of quality; to input the important quality accident data, to input the monthly, quarterly, and annual examination data, and to input the data of minutes of meeting and regular meeting contents data. By processing WBS method to disassemble the project to many sub-items, form sub-divisional acceptance, it can form the relation of divisional and sub-divisional with contract, form the quality evaluating monthly reports, and edit of the unit works.

Document Management is to process management of the company's receiving and sending documents examination and approval.

Financial Management is to manage and count all kinds of financial expense receipts of the company, and available to be checked, seen, and counted.

Mechanical-Electrical Equipment Management contains counting the information of materials and equipment provided from party A, which includes loading, receiving and using, allocating and transferring, returning, account seeking and counting and etcetera. Equipment management module accomplishes the main equipment information (supplier, main technical parameters), builds up the equipment management account; accomplishes the query of spares parts. Wind power equipment's coding categories are following the standard coding. Reserved interfaces are needed when designing the system, so it can meet the demand of transferring and fastening.

Safety Management requires to implement the country and superior's production safety laws and regulations, principles, policies, and follow the rules of what mentioned above, organize and compile the plan of company's safety production, carry on safety issues in production training and propagating, and reporting and handling if coming across severe safety accidents. Input of safety events, safety annual reports, quarterly reports and monthly reports, hidden danger accidents and handling of accidents processes, meetings or regular meetings contents, safety rewards and punishments management.

3. System Architecture

3.1. Organization Structure

Wind power project company is in charge of the whole process of engineering construction. Organization structure contains decision layer's general meetings of stockholders, board of directors, board of supervisors; executive level's general manager, deputy general manager, general accountant, chief engineer; specific execution layers of the Business Department, Engineering and Technology Department, Planning and Contract Department, Financial Management Department, Mechanical and Electrical Materials Department, and General Management Department. Organization structure has been shown in chart 1.
3.2. Software Structure

System software is divided into three layers of structure, which is Presentation Layer, Business Logic Layer, and Data Access Layer. Presentation Layer contains regular specific execution department, the human machine interface to deal with businesses, and also contains what management layer and decision layer see the business indicators of the project company. Business logic layer accomplishes the project company's core businesses of mechanical-electrical equipment management, quality management, budgetary estimate management, safety management, schedule management, contract management, financial management, document management and etcetera. It has been shown in chart 2.

3.3. Hardware Structure

Under the background of rapid development of technology like Internet, huge data, and 5G, a large number of publicly-owned cloud data centers of huge data and basic platforms of cloud computing emerged in the market. It should meet the system's hardware system requirements. Hardware structure of this system is using cloud services, which contain digital signal processing and calculation, data storage, web services and other functions. It has been shown in chart 3.
4. System Implementation

4.1. Main Interface of System

Users (not system administrator)\textapos;s data is uploaded together by backstage administrators and inform the users\textapos; initialize password and other information, but not being able to register personally. The login interface has been shown in chart 4.

After Users (not system administrator) have signed in, they\textapos;ll see the system interface has divided into four areas. The title bar is on the top. On the left side is the function navigation area. Right side is the contents exhibition area, and the bottom is the copyright state area. It has been shown in chart 5.
4.2. Related System Interface

Based on PHP developing environment to input the engineering inventory Excel of tender results to the database. The proceeding way is shown as below (code parts):

```php
public function imports()
{
    header("Content-Type:text/html;charset=utf-8");
    $upload=new \Think\Upload();
    $upload->maxSize=3145728;
    $upload->exts=array('xls', 'xlsx');
    $upload->rootPath='./public/Uploads/';
    // upload the file
    $info=$upload->uploadOne($_FILES['excelData']);
    $filename=$upload->rootPath . $info['savepath'].$info['savename'];
    $exts=$info['ext'];
    if (!$info) {
        $this->error($upload->getError());
    } else {// upload success
        $this->data_import($filename, $exts,3);
    }
}
```

5. Conclusions and Prospects

Since wind power project company adopted the engineering management system, business process has been solidified, the efficiency of every link of the entire engineering construction process has been improved, the wearing costs of link between link has been deduced. The digitalize equipment management and control, has decreased the loss of construction materials. The digitalize process management and control, has reinforced the on-time engineering process. The digitalize settlement account can constantly analyze the engineering investment and engineering materials' completed conditions' matching degree, which would ensure the safety of project investment. The accumulation data of the engineering construction process has provided the robust guarantee to the Digitalize and Physical Delivery.

References

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