

Applications of "ITIL +" Concept in Engineering Design Enterprises

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Abstract. Engineering design enterprises are now facing many IT operation problems with the further development of information construction in these enterprises. The best solution to solve the IT operational problems is to build IT operational systems based on ITIL. As IT cost accounting based on engineering projects and health evaluation on IT infrastructure do not fall into the category of ITIL system, the concept of "ITIL +" is provided in this paper to introduce the implementation process of IT cost accounting based on engineering projects and health evaluation of IT infrastructure, which not only increase the level of operations in engineering design enterprises, but also create the additional value of ITIL products.

Introduction

With the further development of information construction in the engineering design enterprise, it is required that operations and maintenances for IT basic resources, such as computer, storage, network and application system, should be improved continuously. Particularly after the implementation of the project of "Engineering Design Cloud", failure in any link of the IT basic resources without precise localization and rapid recovery would lead to paralysis of the entire business chain. Without the fast and effective way for fault location, fault recovery and business interruption would last for a long time, which surely affects design and production efficiency. Operations and maintenances in such a "piecemeal" and "fire-put off" way is often proved to be nonstandard and inefficient. Consequently, it is difficult to upgrade users' satisfaction[1]. Therefore, to make IT operation and maintenance service plan for management based on the ITIL standard and properly conforming to the business service model of engineering design enterprises, is the best way to solve the problem.

ITIL is a universal theory of IT service management, which can provide enterprises with rigorous and standard IT service management practices. ITIL framework mainly consists of business management, service management, IT infrastructure management, security management, application management module, etc[2-4].

Project is the business unit in engineering design enterprises. IT operational systems produce a large number of operation data based on the project, which provides a data basis for IT cost accounting based on engineering projects and health evaluation of IT infrastructure. IT cost accounting based on project and health evaluation on IT infrastructure does not fall into ITIL framework, but it is not desired to realize the cost accounting of project and health evaluation on IT infrastructure without the application system of ITIL, so it is need to extend of ITIL theory. This paper presents the concept of "ITIL +". This concept is not a simple complement of ITIL system, it is a new industry status. Information technology exists in various industries and applications with rapid development and popularization applications of the Internet, as long as IT application exists, there must be operational service, which provides a broad space for the development of "ITIL+". In addition, as data go through the various fields of IT applications as well as wide applications of big data and data mining, they provide the foundation of data for the various applications of "ITIL+".

The connotation of “ITIL+” concept

“ITIL+” is "ITIL + business innovation", the main characteristics of “ITIL+” concept include:

Deep fusion. “+” is deep cross-border integration, which makes ITIL generate new value in other areas, such as IT cost accounting, health evaluation on IT infrastructure, etc.

Value-added services. ITIL "+" means the additional value of ITIL.

Expanding application. "ITIL +" means that the target groups and the areas of ITIL technology applications should be increased or promoted.

The "+" of “ITIL+” refers to the various applications of IT. There are no universal ways and means of “ITIL +”. In practice, it should be based on data processing and deep mining application of the internal data and external data sources, from the data mining to quantitative decision-making and find the best applications suitable for the enterprises in "ITIL +". The technologies such as data mining, big data, etc. should be employed to expand and improve the application effects and obtain more space for increasing business values.

Applications of "ITIL +" concept in engineering design enterprises

IT cost accounting based on engineering projects. Engineering project cost accounting of engineering design enterprises generally does not include IT resources cost accounting, and engineering project personnel cost according to the manual accounting which is calculated based on man-filled by designers without enough effective supervision. IT operational systems based on ITIL collect all kinds of IT resources consumption operation data of the project, which generates the possibility of IT cost accounting based on engineering projects.

First of all, IT resources cost accounting model should be built to account the IT cost based on project. IT resources cost accounting model provided in this paper is set up on Activities-Based Cost Method. Activities-Based Cost Method is a kind of cost calculation method based on activity, which distributes costs using different indirect cost allocation rate for all kinds of main indirect expenses. It is a more accurate method of distribution of indirect expenses and auxiliary resources. In order to use the Activities-Based Cost Method to cost accounting, the following five elements should be determined first: resources, homework, object cost, cost drivers and distribution path.

Resource

Resource in IT resource cost accounting refers to the IT resource costs, which ensures the normal operations of engineering design business. It mainly includes infrastructure and equipment cost, software license fee and artificial cost. Figure 1 shows IT resource cost range.

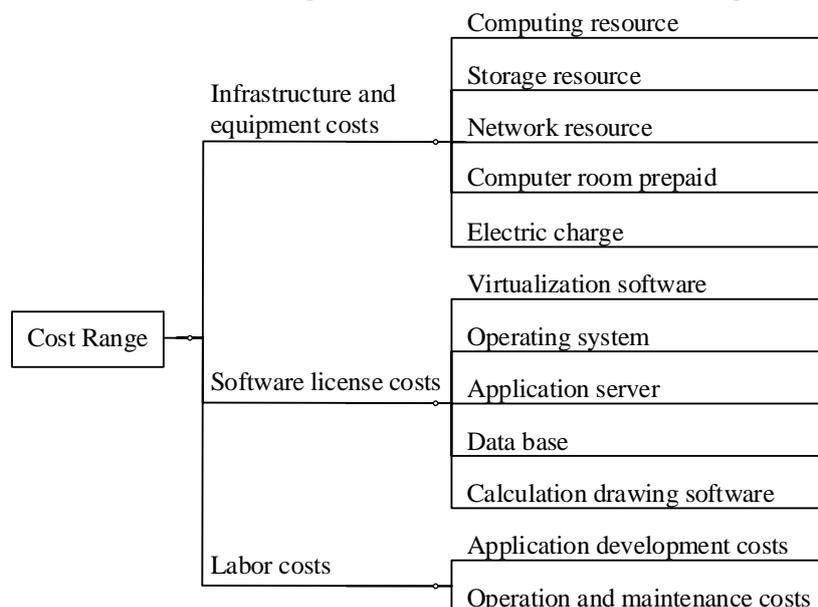


Fig. 1 Range of IT resource costs

Activity

IT operation is the quantitative standard of work during operation for each project, including the labor cost and IT resources. The labor cost comes from the enterprise ERP system. The fees for operation staff vary with their levels.

Cost Object

Cost object is the project of engineering design enterprises. Engineering projects have to be operated and maintained by IT engineers, so all kinds of IT resources are consumed.

Cost Drivers

Cost drivers refer to the cause of distribution in IT resource of engineering projects, which covers resource drivers, activity drivers and cost object drivers. Different IT resource environments and different levels of the IT operation technicians should be assigned for different investment scales and the importance of the projects

Assignment Path

The assignment path of IT resources cost accounting refers to the investment plan that can count consumption cost of IT resources and data center project investment expediently according to the IT project cost accounting and data center IT resources cost accounting for the whole year, etc.

IT resources cost accounting based on engineering project needs to count IT resources costs of the entire personnel in project lifecycle and IT resources costs of the members of the project.

Cost accounting of the entire personnel in project lifecycle

The cost price of all kinds of resources for the project is calculated according to the IT resources cost accounting model. The IT resources cost consumed in project lifecycle are calculated based on the number of software and hardware and the time consumed.

IT resource cost accounting of the project staff

Project managers can inspect the detailed IT resources cost accounting of each project. They can also realize the horizontal contrast between the projects and strengthen the management of project personnel working hours through IT resource consumption cost. The project manager can inspect the IT resource details of all team members consumed in the project. He can realize the longitudinal comparison between project members, which works as a foundation based on project performance evaluation, as well as the decision reference for the similar engineering project personnel.

By statistical analysis, all IT resources consumption cost of the project in 2015 is RMB 6810000. The estimate value of IT resource cost accounting in 2015 is RMB 5000000. Due to the depreciation of equipment room, air conditioning is not included in the manual estimation range. Computer room, air conditioning annual depreciation charge is RMB 1500000 according to the company supplies depreciation method for calculating. The errors between calculation results and the artificial estimate results reach RMB 310000. In addition, the system selects two projects of same category and same size for comparison. The error of the project's IT resources consumption cost is just 0.3%. Therefore, the cost accounting based on engineering project is scientific and reasonable.

Health evaluation on IT infrastructure. Effective implementation of ITIL can regulate and improve IT operational management for related enterprises. But it can not evaluate the health of IT infrastructure. Healthy and continuous operation of IT infrastructure is the foundation of the stable operation of enterprise businesses. Usually in the non fault condition, there is no accurate evaluation on its operational conditions of the IT infrastructure, so it is necessary to evaluate the health status of IT infrastructure comprehensively.

In addition to failure, there is no accurate evaluation on its operational conditions of the IT infrastructure. Therefore, it is required to quantify and evaluate the IT infrastructure health status, describe the health status of the IT infrastructure by health level. Each grade represents the exact risk factor and system security of IT infrastructure.

Health state classification of IT infrastructure

In this paper, the theory of fuzzy mathematics is used to construct IT infrastructure health grade membership function. In order to show the fuzzy concept, it is necessary to introduce the concept of fuzzy set and membership function.

“A” is called fuzzy set, which is constituted by 0.1. It indicates the degree of the element x belonging to the fuzzy set A, and its value range is [0, 1], the degree is called x belonging to the fuzzy set A membership degree.

$$\mu_A \begin{cases} 1 & x \in A \\ (0,1) & \text{the degree of X belongs to A} \\ 0 & x \notin A \end{cases} \quad (1)$$

During the assessment of IT infrastructure health, the stand or fall of IT infrastructure environment boundaries is also vague, and can't simply use "good" or "bad" to describe them. It should be described as the extent to which the "good" belonging and to what extent to the "bad". Therefore, using the membership degree to describe the degree of "good" and "bad" is reasonable and scientific.

The system can classify IT infrastructure health levels based on the fuzzy evaluation results. To classify IT infrastructure health levels into nine grades is a cumbersome work. Also it is too coarse if health levels are only classified into three grades and it is not the usual performance for project. If classified into seven grades, it will produce infinite decimals when number 7 as the divisor and in this way the grade area can't be divided averagely. Number 5 has a very good dividend character, so it is more scientific and reasonable that health status of IT infrastructure is divided into five grades. In this paper, health status of IT infrastructure is divided into five grades including failure, abnormal, qualified, sub-health and health.

Assessment of IT infrastructure health evaluation weights

IT infrastructure including network, servers, storage, air conditioning, UPS, etc. Network, servers, storage are the key factors that affect the running state of the IT infrastructure, air conditioning, UPS focus on operation security, which can't influence on the running state of the IT infrastructure, therefore can not be considered when assess health status. Therefore, according to the enterprise IT operational practice, only select the weighted network, servers, storage to weighted and evaluate IT infrastructure health level.

Usually, there are two indexes weighted methods: experience weighted method and mathematic weighted method. Experience weighted method is also called qualitative weighted method. Its main advantage is that the weight can be assessed by expert directly. This is simple. The mathematic weighted method is also called quantitative weighted method. It is based on experience with mathematical theory background. It is generates indirectly with a strong scientific nature, but a large number of calculations are required. In this paper, the experience weighting method is adopted because of its simple index to evaluate the object.

The effects of network, server and storage on the running state of the IT infrastructure are different. Their importance weights are determined according to the roles they play in IT infrastructure operation.

Network importance weights: 0.5

Server importance weights: 0.4

Storage importance weights: 0.1

The IT infrastructure health index (β) is calculated according to the importance weights of network, server, storage, and the resource usage rate of each factor. The comprehensive health of IT infrastructure is determined according to grades of IT Infrastructure health Index.

Table 1 Grades of IT Infrastructure health Index

health index (β)	Grade of health
0—0.2	health
0.2—0.4	sub-health
0.4—0.6	qualified
0.6—0.8	abnormal
0.8—1	failure

When the health index is in a critical value, use "ceiling" principles to determine the level of health. For example, when the health index is 0.2, the grade of health Index of IT Infrastructure is “sub-health”

When the grade of IT Infrastructure health Index is unhealthy, the system sounds the alarms automatically and sends the warning information to the front desk. Operation staff can focus on IT infrastructure comprehensive health indicators at any time. They deal with failure timely when they receive warning information, which ensures smooth, continuous operation of the IT infrastructure. In the design business peak, operation staff pays attention to IT infrastructure operation condition closely. When the grade of IT Infrastructure health Index is unhealthy, they target the failure according to the unhealthy equipment list of the system. The system has dealt with 17 warning events since the implementation (January 2015 - December 2015). This ensures the IT infrastructure of healthy running. It provides a stable and reliable IT environment for the businesses in design and scientific research.

Expectation of “ITIL+” concept

With the application of data, knowledge and intelligence in all fields, it will promote the wide appreciations and rapid development of ITIL technology. With continuous operation of IT system and accumulation of data, data can be mined deeply. Intelligent analysis model is established, which can be used to analyze all kinds of applications in IT system. It can warn, deal with faults and provide optimized analysis of the system functions, optimize the link of prone to failure. In addition, the system can also sums up all kinds of data about user applications, analyzing and summarizing using habits of all kinds of system users, reminder smartly or default users all kinds of operation. It can raise the levels of intelligent applications in the system, and turn application system from an operating tool into an intelligent assistant.

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