A Classification Method Based on Improved BIA Model for Operation and Maintenance of Information System in Large Electric Power Enterprise

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Abstract. As the integration of informatization and industrialization goes deeper in State Grid Jiangsu Electric Power Company, the lean management of O&M (operation and maintenance) of information system plays a more important role in the company's production and management. On the ground of a full investigation of the current information system of the company, this paper has improved the model of business impact analysis (BIA) and, based on which, proposed a new method to classify O&M of information system. As proved in our practices in the company, the proposed model and method are efficient in controlling the cost of optimizing the operation of the information system, raising the efficiency of resource utilization as well as in improving the O&M management.

1 Introduction

As the informatization strategy has been gradually implemented in State Grid Jiangsu Electric Power Company (hereafter referred to as "the company"), the information system has now covered all businesses of the company, where information becomes more integrated with businesses and the information is increasingly prominent as a supporter. A safe and stale operation of the information system is the foundation for the company to carry out its businesses. Now, the company has higher requirements for quick and steady information service, attributing to the application of new IT technologies such as cloud computing [1–3], internet of things [4–6] and big data [7], etc. In order to further improve the management of the information system, so as to guarantee a safe, stable and efficient operation, the company is now carrying out the research topic on classification service of the information system O&M.

2 Status Analysis

In China, classification [8] is a common method to manage information system. Under the precondition of guarantee both the reliability and the usability, this method can maximize the utilization of service resources. It is known that using classification to

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optimize the allocation of the operational resources of information system is the most efficient management method. In the late 1990s, the classification management of information system O&M, as a part of ITIL, was introduced to Chinese firms, and, since then, it becomes more evolved. By far, similar schemes are used in famous Chines state-owned enterprises, including Bank of Communications and China Mobile, to manage information system O&M.

At present, all information systems of the company are operated and maintained in accordance with the highest standard, which, however, results in a low rate of resource utilization as more resources are invested for guarantee the information system O&M. This is because the only standard is used both for the core businesses, such as marketing a production that have higher requirements on O&M services, and for the non-control businesses and management information system that have lower requirements on O&M services. The O&M resources allocated to the core businesses are insufficient on the one hand, while some of the O&M resources allocated to the non-core businesses are wasted on the other hand. It is an urgent challenge to comprehensively mange all O&M resources and support multiple information systems, with giving priority to satisfy the O&M requirements during special time domains as well as during rush hours.

3 The Improved Information System Classification Model

3.1 Objective and Principle of the Model

Business impact analysis, abbreviated as BIA, is a method for evaluating the effect of service interruption on an organization's businesses. It has been widely used for O&M classification of information systems in many industries, including finance, communication and energy. According to the methodology of BIA and based on the actual conditions of the company's information system, this paper has improved the information system classification model and proposed a method for the classified O&M services, which realizes the management of the classified O&M services and can stabilize the operation of the information system, raising both the users' satisfaction and the O&M service value.

In the information system classification model proposed in this paper, the levels of the information systems are determined by evaluating the impacts of service interruption on the company's businesses, with consideration of the company's development strategy, informatization plan, regulatory compliance, user scale, internal impact, external impact, substitutability, correlation to other systems and supervision requirements. On this basis, measures for guarantee each level of the O&M services are worked out. The following principles are obeyed during our study.

Principle 1: business-oriented. In the information system classification model, the practical business demands shall be considered to evaluate the O&M service resources required for the operation of the system, and the classification shall be based on satisfying the business demands.

Principle 2: maximization of resource utilization. After satisfying the business demands of each information system, the model shall be reasonable to allocate and utilize the resources, so as to maximize the O&M service resources.

Principle 3: standardized classification. During the classification of the information systems, requirements as stated in the *Management Specifications of Informatization Standards for State Grid Corporations (Trail)* (No. 307, Information Technology (2010)) shall be followed to establish a set of normative and standard procedures, which is used to classify the O&M services of all the information system, and the classification shall also be reasonable and operable.

Principle 4: sustainability. The standard for classifying the O&M services shall be efficient, usable and improvable during a long term and shall be extended and modified according to objective requirements. In addition, it shall not be frequently changed for predictable problems or causes.

3.2 Content of the Model

Classification Settings

According the different impacts on business, the O&M services of the company's information system are classified into three levels: ordinary maintenance level (level 3), fundamental level (level 2) and guarantee level during rush hours (level 1). Considering that there are periods during which important events may be held or the company has special requirements on the information system, we set the fourth level: special guarantee level (special level), as shown in Table 1.

Table 1. Classification settings

Level	Name	Description
Level 1	Guarantee level during rush hours	Information system is very important. The impact of system interruption is serious
Level 2	Fundamental level	Information system is less important. The impact of system interruption is not very serious
Level 3	Ordinary maintenance level	Information system is not very important. The impact of system interruption is little
Special level	Special guarantee level	Important events may be held or there are special requirements on the information system

Procedure of the Model

The special procedure of the information system classification model is shown in Fig. 1. First of all, the model evaluates the business impacts of a business system during normal periods. Then, the model evaluates the business impacts of the business system during different business cycles. Finally, according to the standard of classifying business impacts, the model evaluates the service levels for the business system under all business cycles.

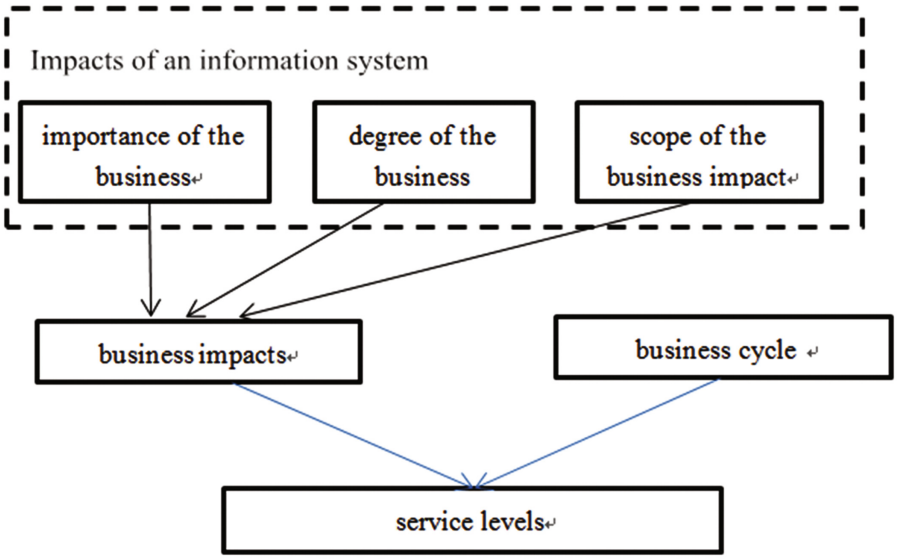

Fig. 1. Flow chart of the information system O&M classification model

First, the business impacts (Φ) of the business system during normal periods are evaluated. Next, the business impacts are evaluated during different business cycles (Ψ). Finally, according to the standard of classifying business impacts, the service levels (Λ) for the business system under all business cycles are evaluated.

Algorithm of the Model

As shown in Fig. 1, the information system for computing the business impact Φ includes three primary factors: importance of the business, degree of the business impact and scope of the business impact. Specifically, the importance of the business (weight 30%) consists of two secondary factors: the type of the information system and the impact of the system on other systems. The degree of the business impact (weight 35%), namely the degree of the impact of interruption on enterprises, society and nation, includes two secondary factors: external impact and the time for the system to tolerate the interruption [9]. The scope of the business impact (weight 30%), namely the range of the impact because of the interruption of the information system, also consists of two secondary factors: the service range and the service object of the information system. With considering practical conditions of the company, in addition, we set another secondary factor: the administrative requirements (weight 5%) from the competent authority, namely the administrative management requirements from a relevant department of our state or the company. Scores of above factors are listed in Table 2.

Table 2. Scores of the factors used for computing the business impact Φ

Number	Secondary factors	A	B	C	D
1	The type of the information system	100	70	40	0
2	The impact of the system on other systems	100	70	40	0
3	External impact and	100	70	40	0
4	The time for the system to tolerate the interruption	100	75	50	25
5	The service range	100	70	40	0
6	The service object	100	70	40	0
7	The administrative requirements	100	70	40	0

In Fig. 1, the business cycle Ψ is the product of the business cycle coefficient (u) and the business impact during a normal period. Table 3 shows the business cycle coefficients during different business cycles.

Table 3. Scores of the factors used for computing the business impact Φ

Number	Business cycles	Business cycle coefficient (u)
1	High	1.5
2	Normal	1
3	Low	0.5

The service level Λ is represented using a percentage score. Indexes of the business impact are weighted and a score is given to each index. Then, the business impact of the information system can be determined by analyzing and computing the indexes.

Step 1: computing the business impact Φ of the information system, as shown in Eq. (1).

$$\Phi = \sum_{k=1}^{n} K*KQ*FQ, \tag{1}$$

where K is the score of a secondary factor; KQ is the weight of a secondary factor; and FQ is the weight of a primary factor.

Step 2: computing the impacts during different business cycles, as shown in Eq. (2).

$$\Lambda = \Phi * u, \tag{2}$$

where u is the coefficient of the business cycle.

A higher score of the service level Λ means a higher level of the system. The scores and levels are defined as follows: the score greater than or equal to 70 means service level-1 (guarantee level); the score of 35 ~ 70 means service level-2 (fundamental level); and the score greater than or equal to 35 means service level-3 (ordinary maintenance level).

3.3 Application of the Model

In the case of the information system in the company, the scores of the seven secondary factors are B, C, B, D, B, C and D, respectively. The levels of the system can then be determined by using the improved information system classification model, as shown in Table 4.

Table 4. Computation of an actual system classification based on our model

Number	Secondary factors	Level	Scores	Impacts
1	The type of the information system	B	70	70*30%*50% = 10.5
2	The impact of the system on other systems	C	40	40*30%*50% = 6
3	External impact and	B	70	70*35% *50% = 12.25
4	The time for the system to tolerate the interruption	D	25	25*35%*50% = 4.38
5	The service range	B	70	70*35% *50% = 12.25
6	The service object	C	40	40*35%*50% = 7
7	The administrative requirements	D	0	
8	Impacts in normal period: 10.5 + 6 +12.25 + 4.38 + 12.25 + 7=52.38			35 < 52.38 < 70, Level 2
9	Impacts in high period: 52.38*1.5 = 78.57			78.57 > 70, Level 1
10	Impacts in low period: 52.38*0.5 = 26.19			26.19 < 35, Level 3

As indicated in the computation, the level-1 O&M service is required during the critical business cycles; the level-2 O&M service is required during shall be provided during normal business cycles, and; the level-3 O&M service is required during the periods when there are not much businesses.

4 Method for System Classification Service

The measures for O&M service are proposed according to the requirements of the company's information system O&M service and the requirements of the *Specifications for Operation and Maintenance of Information System in State Grid Corporations* (*Trail*) (No. 144, Security of Information Operation (2009)), with a full consideration of the information system itself and both hardware and software in the system.

The design of the O&M service at each level satisfies the highest requirements of all the information system under the current level. According to the volume of the businesses, the time of using the information system can be divided into: working period and non-working period. Therefore, more detailed measures can worked out to guarantee the service according to the different periods. Table 5 lists some level-1 (guarantee level) O&M service requirements.

Table 5. O&M service requirements

Number	Service periods	Measures for O&M service	Descriptions
1	Running	Monitor	7*24
2		Patrol	Twice a day
3		Backups [10]	Three times a day
4		Contingency	One hour
5	Overhaul	Scheduled maintenance	Standby unattended time
6		Failure response	5 min
7		Crash recovery	One hour
8		Fault feedback	3 days
9	Custom service	Response time	5 min
10		Process time	2 h

5 Conclusions

On the ground of a full investigation of the current conditions and requirements of the company's information system O&M, with consideration of the advanced ideas using for classifying information system O&M services in China, this paper has proposed the improved information system classification model and, based on which, put forward a new classification method. After been used in the company, this method has significantly raised the efficiency of using both human and material resources, greatly secured the operation and management of the information system and laid solid foundation for the company to promote the automation of the O&M.

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