Internal Accounting Control Based on Computerization System

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Abstract
Accounting computerization system is a complex information system which is built on computer basis and internal control is one of important sub-systems. Authenticity and reliability of accounting information can be ensured by setting internal control; Moreover, creditability and timeliness of accounting record and accounting report can be enhanced as well; besides, errors, fraudulent behaviors and so on can be prevented in this way. This paper analyzes it from two aspects: firstly, based on the application of informational theory in business process reengineering, informational theory is promoted to the evaluation of internal control process over accounting report. It is used to describe and simulate accounting report internal control process and realize mathematical description of internal control process. In addition, it contributes to further analysis of each control activity of process from the aspect of quantitative analysis. Secondly, in terms of internal control activity evaluation over accounting report, entropy- weight coefficient is used to assess the effectiveness and cost of internal control process over accounting report.
Key words: COMPUTERIZATION SYSTEM, INFORMATIONAL THEORY, ENTROPY-WEIGHT COEFFICIENT, INTERNAL CONTROL

1. Introduction

Accounting computerization is the abbreviation of applying contemporary IT (focus on electronic computer) in accounting practice. By means of electronic computer, accounting data process can be realized; bookkeeping, accounts and reimbursement can also be finished; moreover, the analysis and prediction of accounting information can be done, which provides support for decision making. In addition, urgent need of production management and rapid development of electronic technique promote the development of accounting computerization. Accounting computerization not only involves the reform of data handling, but also contributes to the innovation and development of accounting system and accounting theory [1].

Computerized accounting control is divided into general controls and application controls, according to the suggestion of American institute of certified public accountants in No 3 of Statement of Auditing Standards [2]. The general controls refer to all behaviors of electronic data process (EDP); while the latter one is related to the control of special accounting event. Therefore, it is considered that general control is the integral control with respect to computerization accounting system; and application control is the control implementing for those crucial runs and operations [3]. The specific content of computerization accounting control under common environment contains: general controls and application controls.

2. General controls of computerized accounting

As one of the major control means for EDP system, general controls concern about organizing and using electronic data processing(EDP); developing

and maintaining regulations which include reviewing and testing of system or program, writing and improving of document and the same work needs to be done for system changing etc; the control in device arranged by manufacturer and the control in software arranged by designer; the control of device and data with respect to contact; and other controls related to the data and process of EDP [4].

(1) Organizational control

The organizational control is to ensure department of electronic data processing can complete data process, specified division of duties and control of personnel management correctly, safely and efficiently. It aims for decreasing incidence of error occurred in department of electronic data processing and the possibility of corrupt practice. The principle requirement of organizational control is about the separation of incompatible duties, namely departure of business process and business record [5]. For example, the process of original accounting document must be examined by leaders of functional division and be checked by accounting officer; and it can be filled in accounting voucher after examination and check [6]. In computerization accounting system, organizational controls mainly have the following measurements: functional departure between electronic data processing department and user department; functional departure within electronic data processing department [7].

(2) Control of system development and maintain

The main risks faced by enterprises when developing computerization accounting system are whether the developed system can reflect user requirement, whether it can meet expected quality standard, whether it can be finished in time and put into use, whether the developing cost is rational and whether the system is legal etc. in order to make sure the system is developed in success, there are three important controls.

(a)Control of developing process

Fundamentally, system developing should always be based on user requirements. The goal, general structure, developing way and each working stage and developing schedule of system developing should be confirmed. Meanwhile, fund-raising should be finished in time and monthly budget should be carefully done. In addition, professionals with different types and different levels needed by the system should be allocated and trained [8]. During this developing process, it not only demands to make overall investigation for each aspect of system data process and make feasibility analysis in technology and economy, but also requires determining functional interface of new system and building suitable model for computerization data processing. Generally speaking, developing process of computerization accounting system should be divided into three stages according to life cycle approach, which are system analysis, system design and system implementation. The control of developing process is allocated on the basis of this; it is implemented and controlled by stages.

(b) Programmable control

This or that errors will occur during programming process; such as syntax and logic errors in program coding; the function realized by program is inconsistent with the function required by user; “Trojan horse” exists in the program, namely, some subprograms with latent and harmful effect are designed in program logic; data errors and process errors. In order to well control these risks, the best way is to test program, which means to find incorrect static test through repeated reading of program or checking flow chart; and to discover discrepancy between the function of single module and the function of defined module through making pilot run for program; moreover, dynamic test of interface problems among modules can also be picked up.

(c) System maintaining Control

System maintaining control includes the maintaining control for system software, maintaining control for data and the maintaining control for document information [9]. The latter two will be discussed in the following sections; hence, we mainly analyze the maintaining control for system software here. Maintaining of system software consists of corrective maintenance, adaptive maintenance and perfective maintenance. Improvement and expansion for system function should be done in all the three maintaining works. However, such improvement may lead to new error occur in system; thus, the maintenance for system software should be controlled, which means that it should require and control according to the procedures of new system developing process.

(3) Control of system security

Reliability of system, security of information and correctness of information processing depend on strong security control [10]. There are many factors affecting system security including natural disaster, work fault, computer practices fraud and criminal activities etc. security control refers to series of measurements and methods that can prevent system from being harmed by these factors and can ensure system’s normal run [11].

(4) Operational control

In order to realize operational control, standard operating regulation should be made strictly and be executed carefully. The essential purpose of operational control is to ensure high quality of information

processing, decrease the occurrence of errors and unauthorized use of document, program and report [12]. The standard operational control contains the control of computer room ministration, control of operating authorization, control of operating regulation and so on.

(5) Filing control

Computerization accounting file is composed of accounting data stored in computer hard-disk, other magnetic media and optical disk, and accounting data printed by computer in written form. The control of computerization accounting file aims to ensure safety and reliability of accounting data. Specification on Computerized Accounting, published by treasury department on 10, June, 1996 stipulates that: (1)the management of computerized accounting file is an important basic accounting work [13]. Accounting file should be managed in the light of relevant provisions of treasury department and it should be taken charge by special person; (2)Prevention work should be well done for the management of computerized accounting file; double copies should be prepared for important accounting files and they should be stored in different places; (3) for the accounting file stored by magnetic media, regular check and regular copy should be done to avoid the loss of accounting file owning to the damage of magnetic media; (4)The full set of documentation including general accounting software, fixed point developing accounting software and the accounting software combining general and fixed point developing accounting software, and accounting software program should be kept as accounting file. Such software should be stopped using after the deadline of maintaining period or five years after major changes [14].

3. Application control of computerized accounting

Application control of computerized accounting concerns about the control measurements built for preventing, checking, correcting error and handling corrupt practice to meet various special requirement of accounting process. There are four main purposes for this control. Firstly, it is to ensure the integrity of input and modification, namely, to guarantee that all current accounting businesses should be input into computer and completely recorded into corresponding computerized accounting file [15]. Secondly, it is to ensure the accuracy of input and modification. The computer must obtain accounting data exactly and record into rel. related accounting file correctly. Thirdly, it is to ensure the efficiency of accounting data, namely, accounting data must be reasonable and legitimate. Fourthly, it is to ensure maintainability of accounting data. The stored data in computerized accounting file are not constant. Part of data can be modified so that its correctness and timeliness can be guaranteed. However, it should be noted that in contrast to general control, application control not only involves manual control, but also refers to auto control of computer. Application control is generally divided into three controls which are input control, handle control and output control.

(1) input control

American institute of certified public accountants defines the input control in Statement on Auditing Standard that "input control is to confirm data are acceptable in electronic data processing and convert the data into the form that can be sensed by machine; moreover, such data can be identified by machine and it should reasonably make sure that the data are not lost, deleted, added, repeated or have not undue change. It refuses incorrect original data or provides those controls for revised data". From the definition of input control, it can be known that input control aims to guarantee that the unauthorized businesses cannot be input into computer; to ensure the authorized business cannot be missed, added, repeated or have improper change; and to make sure the incorrect business cannot be eliminated and corrected. Generally speaking, the specific input control measurements contain that subject related file building, reference files setting for corresponding relationship, trial balance control, personnel control, repeated input or double input control, sequential calibration control, total number control and logic control.

(2) handling control

Handle control are the control measures direct at data processing activity within computer system. The fact that whether data process is correct and whether the result is reliable rely on the correctness and reliability of inputting data to a great extent; in addition, it also depends on the correctness of application program and the strengthen of environmental control. However, some errors such as logic error, accounting error, filing and recording error may still occur even if the above requirements are met. Hence, the following control measures should also be set to ensure economic business can be disposed correctly by computer and the errors in handling can be indentified and corrected. The measurements include: output interviewing of disposed result, efficient checking for disposed data and the control of error correctness.

(3) output control

The output control is to ensure the correctness of disposed result (e.g. general ledger, subsidiary account and accounting statement etc) and guarantee

that such results are transferred to legal users by appointed staff in accordance with correct path. Some errors such as output information delivered to users are incorrect or incomplete; the output report is elusive; report is sent to unauthorized user; output result is undelivered or cannot be delivered in time and so on are commonly happened in computerization accounting system. Therefore, some corresponding control measures must be taken to decrease such mistakes.

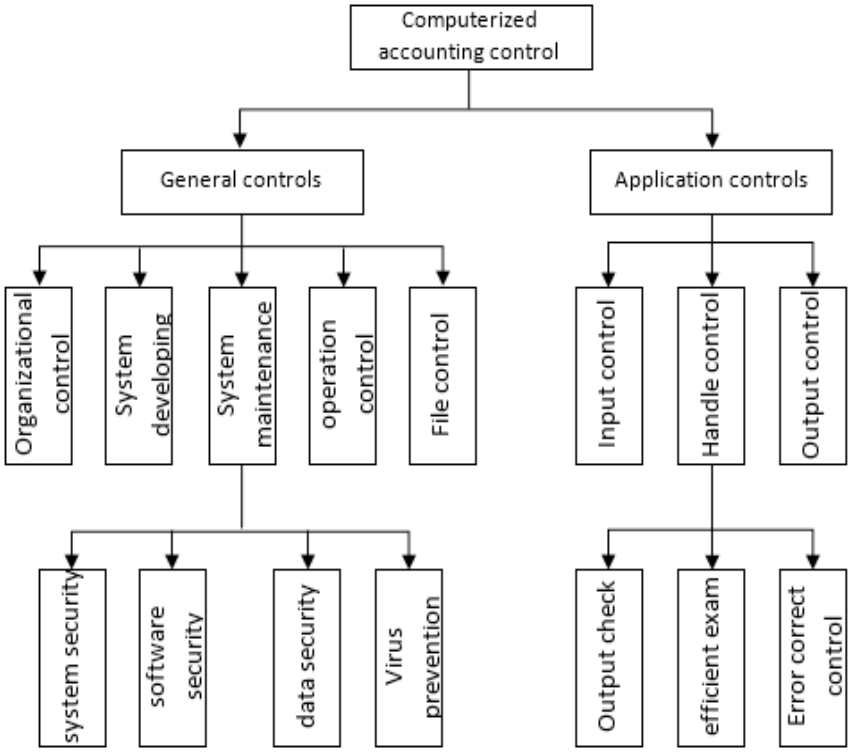

Figure 1. Content of computerization accounting control

Generally speaking, control methods for possible errors may occur in output is that: format, way, content and time of output is set according to user requirement; total input number is checked with overall output number; output result is examined and correctness and integrity of output result are verified; result of current output is compared with previous output result and the rational of output result is checked; specific report deliver member is appointed to ensure the report can be delivered into authorized receiver in time; register book of output report is built to record copies, time, deliver member and receiver of report sending so that errors such as mistake, leakage and repeated sending can be avoided. All in all, content of computerization accounting control can be seen as figure 1.

2. Method of real-time accounting control

Accounting control methods refer to those means that can reflect the content, execution and accomplishment of accounting control. For the methods of real-time accounting control, some basic control systems such as duty separation system, authorized approval system, property preservation system and financial reporting system should first be built to strengthen its principle control for business finance. They are also the basic approaches of real-time accounting control. Obviously, the basic accounting control methods can't realize real-time control; hence, more control methods and measures are needed to guarantee the implement of control. Besides, the control for real-time information system needs to be enhanced more, especially within IT environment. Here, system maintaining position, data auditing position and file managing position are set to realize system control.

It is an important prerequisite to build and perfect enterprise computer network. This network should cover each department of enterprise and achieve interconnection and data sharing among departments. IT environmental model of real-time accounting control can be shown as figure 4.

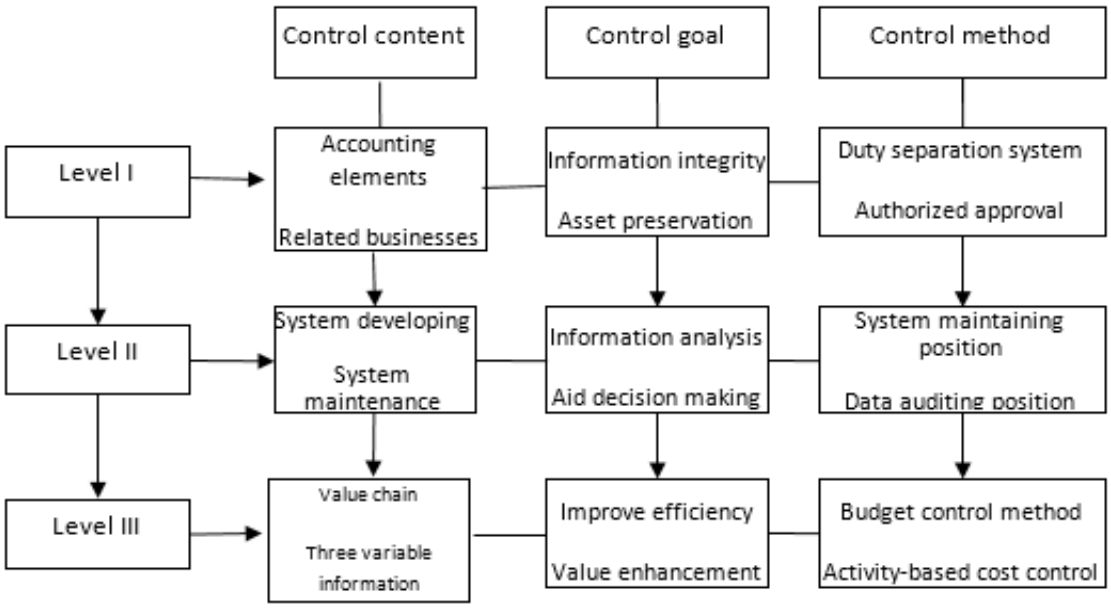

Figure 2. Theory of real-time accounting control

2.1 Design of accounting process re-engineering

The development of IT, especially the application of data integration technology and network technology provide reliable assurance for disposing complex data. So IT may bring greater revolution to financial accounting field. The specific process can be seen as figure 5.

In the new accounting process, business performance is carried out by business department according to initial department budget; and business information is timely submitted to integrated business database. After that, business data are picked up from integrated business database respectively by internal and external financial database in accordance with its own information collection rule. Financial data is formed after such processing. Data information related to business is re-selected from internal financial database by business department-based financial system; and such information is back-fed to business department promptly. In the end, business department adjust its business goal according to real time feedback.

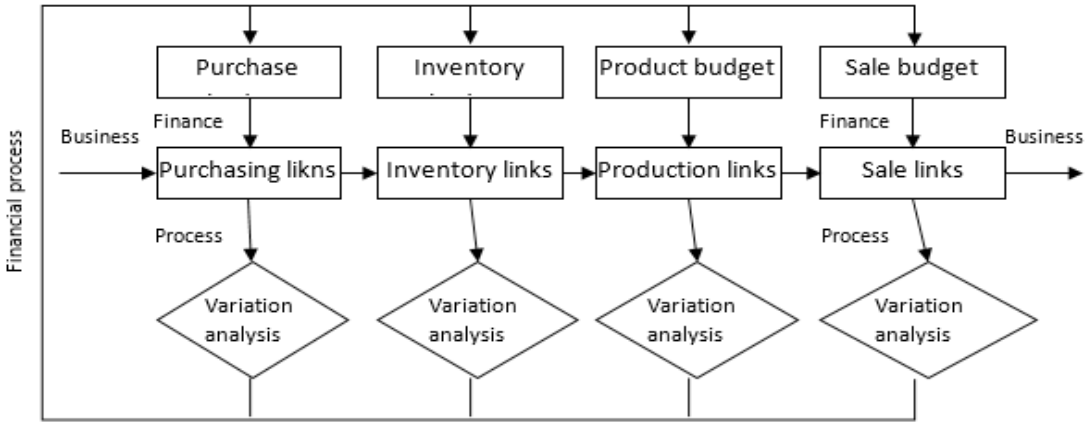

Figure 3. Landscape mode of real-time accounting control

2.2 Building of mathematical description for internal control process of financial report

Information can be divided into two categories which are discrete information and continuous information. The source producing discrete information is called as discrete information source. Similarly, the source producing continuous information is called as continuous information source. There are only limited symbols in discrete information source. So, discrete information can be regarded as a random sequence of limited states. It can be described by using statistical property of discrete typed random process. In this

paper, we use discrete information source.

Let's assume that this information source is $\begin{Bmatrix} X \\ P(x) \end{Bmatrix}$, where X is event happened. It refers to accounting information before entering an operation step of content control process in this paper; P(x)indicates probability of the event. If X1 show correct accounting information elements; X2 express as distorted accounting information element; p1 is the probability of X1; and p2 is the probability of X2. Then, source of information can be expressed as $\begin{bmatrix} X \\ p(x) \end{bmatrix} = \begin{bmatrix} X_1 X_2 \\ p_1 p_2 \end{bmatrix}$. Where $\sum p_i = 1$. During information transferring, the result obtained through a channel can be regarded as the source of next channel. Hence, information state can be shown as $\begin{bmatrix} X \\ p(x) \end{bmatrix} = \begin{bmatrix} X_1 X_2 \\ p_1 p_2 \end{bmatrix}$ in delivery process. Where $\sum p_i = 1$.
The above process can be described by means of information channel in information theory. Here, information channel is the path for information delivering; it is a media to transfer, store, and handle information. Generally speaking, transferring probability of single discrete symbol can be indicated by matrix form, namely

b 1 b2

$$\begin{matrix} a_1 \\ a_2 \end{matrix} \begin{bmatrix} P(b_1|a_1) & P(b_2|a_1) \\ P(b_1|a_2) & P(b_2|a_2) \end{bmatrix}$$

Where, a1 and a2 are input end; b1 and b2 are output end. The probability of matrix can be written as $P(_{aj|ai})=P_{ij}$ for conveniently describing. So the transfer matrix of information channel is:

$P = \begin{bmatrix} p_{11} & p_{12}) \\ p_{21} & p_{22}) \end{bmatrix}$,where $p_{ij} \geq 0$ and $\sum P_{ij} = 1$

From above mentioned definition, it can be seen that property of information channel can be described by information transferring matrix. In this paper, internal control process is described in simulation according to the idea of information channel. Each operating step and control activity in the process can be considered as an information channel. The information flow out from every information channel is the source of next information channel.

3. Application of entropy method

3.1 Fundamental principle of entropy method

It is supposed that there is m evaluating objects with n evaluation indexes. So the original index data matrix can be indicated as $X = (x_{ij})_{max}$. For some index x_j, the bigger difference of index x_{ij}, the bigger role of this index played in comprehensive evaluation; if some index values are equal, then this index hardly play any role in overall evaluation.

Entropy is a measurement of system uncertainty. The system may be left in n kinds of different states and the probability of each state is p_i (i = 1 , 2 , … , n); Then the entropy of this system is:

$$H(x) = -\sum_{t=1}^{v} p(x_i) \ln p(x_i) \quad (1)$$

Where, pi satisfies the requirement of $0 \leq p)(x_i \leq 1$ and $\sum_{i=1}^{n} p(x_i) = 1$

When $p)(x_1 = \frac{1}{m}$, namely, when the their probabilities are equal, then the maximum value of entropy can be gotten $E_{max} = \ln (m)$

3.2 Weighing step of entropy method

(1)Each index is quantified with same degree. Then weight pij of index value under the *i*-th plan of jth index can be calculated as:

$$p_{ij} = \frac{x_{ij}}{\sum_{i=1}^{m} x_{ij}} \quad (2)$$

(2)The entropy value of the jth index $e_f = -k\sum_{i=1}^{m} p_{ij} \ln p_{ij}$.

Where k > 0, In is natural number, and $e_f \geq 0$. If x_{ij} are same for given $_j$, and then $p_{xj} = \frac{x_{ij}}{\sum_{i=1}^{m} x_{ij}} = \frac{1}{m}$. e_f should be the maximum value at this time.

Namely

$$e_f = -k\sum_{i=1}^{m} \frac{1}{m} \ln \frac{1}{m} = k \frac{1}{\ln m} \quad (3)$$

If $k = \frac{1}{\ln m}$, then $0 \leq e_f \leq 1$

(3)Calculation of difference coefficient gj of the jth index

For given j, the smaller of the difference among x_{ij}, the bigger of ej. If all x_{ij} are equal, and $e_f = e_{max} = 1$, then index x_{ij} has no effect for the comparison of schemes; when the bigger difference of the index value among various plan, then smaller of ef; and the bigger role of this index played for plan. The differential coefficient g_j is defined as

$$g_j = 1 - e_f \quad (4)$$

The bigger of gj, the more important of index; difference coefficient vector G=(g1,g2,…,gn) at this time.

(4)index weight ϖ_f can be obtained as

$$\varpi_f = \frac{g_j}{\sum_{i=1}^{n} g_f} \quad (j=1,2,3,\ldots,n) \ , \ (j=1,2,3,,n) \quad (5)$$

3.3 Building of mathematical description for internal control process

(1)concretization of transferred matrix

Suppose that the source is $\begin{bmatrix} X \\ P(x) \end{bmatrix} = \begin{bmatrix} X_i & X_2 \\ p_i & p_2 \end{bmatrix}$. Where

$\sum_i p_i = 1$; it is regarded as the first source of process. Because there is no information distorted, the $p_1 = 1$ and $p_2 = 0$ indicates that the probability of event X_1 accounting information transferring correctly is 1 and the probability of event X_2 is 0. The original source can be expressed as(1 , 0).

To sum up, the following mathematical expression can describe the common control process:

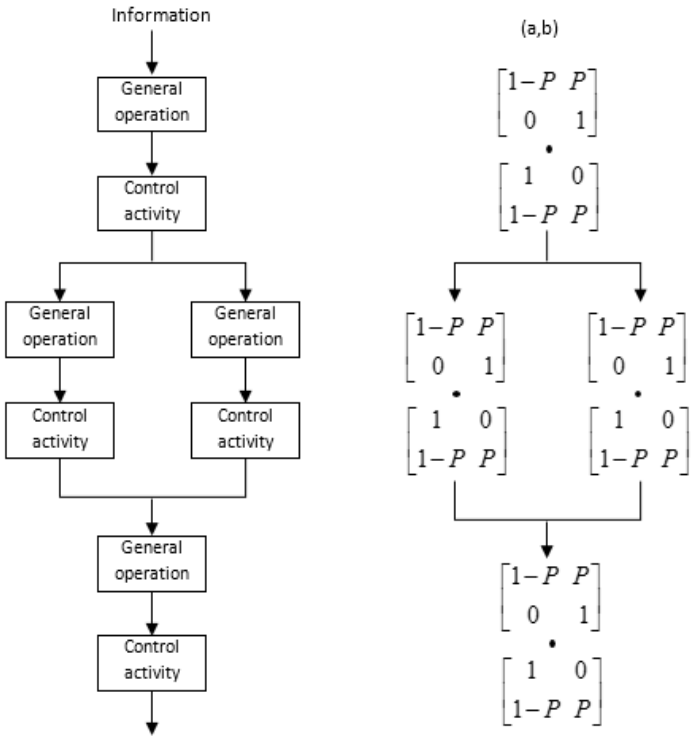

Figure 4. Comarrison between process and math description

(2)the calculation of controlling activity based cost

Weight of labor cost for each control activity should be calculated firstly. Before calculation, time T_j spending on control activity within unit period of each control point should be counted, where (j = 1 , 2 , … , n).

The salary of related control members added because of increasing control activities should be counted. It is labor cost Ck, , (k = 1,2,…,l). As the division of each control activity mainly relies on time proportion spend on control activity they taking charge of, labor cost of each control member on every control activity is C^t_{kj}. After that, the allocated cost of each control activity is summed; and then labor cost of each control activity can be gotten. It can be seen as the following table:

Table 1. Distribution cost of control activities

No. of group	Corresponding control labor cost	time proportion of related control activity	Cost allocated to each control activity	number of control line activity
No 1 control professionals	C1	Ti	C11	i
		Tj	C12	j
No 2 control professionals	C2	Tj	C21	j
		Tk	C22	k
No 3 control professionals	C3	Ti	C31	i
		Tk	C32	k

Then the control labor cost of each control activity is:

Table 2. Cost of control activity

Number of control point	i	j	k
Labor cost of control activity	C11+C31	C12+C21	C22+C32
Labor cost of control activity	Ci	Cj	Ck

Weight of labor cost of control activity is:

$$\varpi_f = C_f / \sum_i C_j \quad (6)$$

On the basis of information of each step calculated from the above(a , b), the information entropy is computed as:

$$H(X) = -(p(a)\log(p(a)) + p(b)\log(p(b))) \quad (7)$$

4. Conclusion

This paper tries to achieve the breakthrough and innovation of the following two aspects: firstly, on the basis of applying business process re-engineering in information theory, it should promote the application of information theory to the evaluation of internal control process of financial report, so that internal control process of financial report can be described and stimulated. This method realizes the mathematic description of internal control process, which lay foundation of the following analysis and research. Secondly, in terms of evaluating control activity of internal control process, the objective weight of control activity can be obtained by using entropy method. It is used to evaluate control activity of internal control process. This method excludes subjective factor, which makes the evaluating result more scientific.

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