

Cost estimation for ISO 9000 certification in Japanese companies

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Abstract

It is widely recognized that ISO 9000 certification bring some profits, such as enhancement of quality system and some concerns. Since one of the major concerns is cost for certification, this paper considers the cost for ISO 9000 certification in Japanese companies through review some winning reports and case studies. Specifically, a model that describes the certification activities and their cost is derived through reviewing some winning reports in order to give a framework of cost estimation. Based on the model, we estimate the certification cost in an electric division of a company through an interview survey. Furthermore, we focused on the cost for promotion and administration as a cost for the sake only certification, because these activities will not be needed if a company does not implement ISO certification. It is concluded that this cost may vary approximately 300,000-700,000 (US\$) per certification by the interview and telephone surveys to Japanese steel companies.

Key Words

Adjustment of system, interview survey, labor expenses, promotion and administration, telephone survey

1. Introduction

It is widely recognized the huge impact of ISO 9000 series in many industries, countries, departments and so on. When we consider the effects of ISO 9000 series, we need to determine some viewpoints under consideration of the feature of ISO 9000. For example, some papers have shown the effects of ISO 9000 in terms of smoothness of trade, complaints of products, defective in process, and so on, such as Hikita et. al. (1995). Other papers have obtained the consequences of certification of ISO 9000 in terms of product quality, customer satisfaction and so on, such as Hansen (1997). Romano (2000) has also discussed some consequences of ISO 9000 certification in Italian companies with an excellent review of a lot of previous studies for ISO 9000. In this paper, we estimate the cost for ISO 9000 certification in Japanese companies through review some winning reports and case studies by the following approach.

In order to give a framework of cost estimation, this paper, first, shows a general model that describes the certification activities and their costs is derived by a review of the winning reports of certification of ISO 9000. An interview survey is conducted to show the effectiveness of the model for cost estimation. Some results on the cost estimation are discussed to clarify the major activities in terms of cost. Furthermore, we focused on the cost for promotion and administration as a cost for the sake only ISO 9000 certification, because it will not be needed if a company does not implement ISO certification. A telephone survey is conducted to explore more precise estimates for promotion and administration cost of ISO 9000 certification.

2. A cost model for ISO 9000 certification

2.1 Activities for certification

In this section, we consider a model that describes the typical activities for ISO 9000 certification and maintenance via in-depth examination on some winning reports of certification. Yamamori (1994) describes what they did to be certified ISO 9001 through his experience in Kanda Tsushin Kogyo, Chiba Factory. Kanda Tsushin Kogyo produces electrical instruments for communication, medical instruments, numerical controller, etc. According to Nikkei financial analysis, that is one of the most confident financial data source in Japan, the number of employee of Kanda Tsushin Kogyo is 483 and its annual sales amount is approximately 140 million US dollars in March 1998, where this value is calculated by 1US\$ = 120 JPY. In addition, this exchange ratio is applied in this paper.

The winning report shows that the top management of Kanda Tsushin Kogyo declared to implement ISO 9001 in order to improve their existing quality system from the viewpoint of ISO 9001. Based on the top management decision, the company started the activities toward ISO 9001 certification. The summary of the activities is as follows:

- (i) First step was establishment a project team (organization) for promotion and administration for ISO 9000 certification, consisting of 13 managers and 1 secretariat. One of the main roles of this organization was promotion and ISO 9000 activities as project design, dissemination, education of employees in related departments and so on. The other main role was administration of the activities in the related departments based on the determined agenda.
- (ii) Once the promotion and administration organization made the project planning, next step was adjustment of the existing quality system in this company. Although there was a few rooms to construct completely new quality system, their main activities were adjustment of existing quality system, such as revise their quality manual to meet the requirements in ISO 9000. The author of this winning report stated that the one of the hardest walls was a consistency of standards among several departments while adjustment of the system for each department was not so hard. The each department staff adjusted each quality system under cooperation with the project team members.
- (iii) When the tentative adjustment of the existing quality system was done, they started pre-assessment of the quality system from the viewpoint of ISO 9001 certification. This company asked for help of external auditors and they assessed together with the internal auditors. After the pre-assessments, corrective actions were taken based on the results of pre-assessments. This winning reports shows that there were two pre-assessments before taking the ISO 9001 assessment.
- (iv) The company takes two-day assessment for ISO 9001 certifications. The assessors pointed out some minor comments. Kanda Tsushin Kogyo took appropriate corrective actions for the comments and obtained ISO 9000 certification on April 15th in 1994. It took around one year from the start to implement the activities.

The above example of the typical activities can be generalized as follows:

- (i) Promotion and administration
- (ii) Adjustment of existing quality system
- (iii) Pre-assessment and its corrective actions
- (iv) Assessment and its corrective actions

We can confirm similar activities in other winning report such as UNITTA Co. by Nitta (1994) and Pental Co. by Ikeda (1995) and so on, while some words, such as the organization names, are different. Therefore, we estimate certification costs based on the above four activities, since the activities seems to be important in many companies.

We next consider the items in income statements relating to each activity shown in the above. For

the promotion and administration, the major expenses may be labor and related expenses and necessary expenses. For example, Kanda Tsushin Kogyo set up an organization including one full-time employee who was expected to work as a secretariat. Furthermore, some committees consisting of top managers were established. Since the promotion does not need to purchase special matters, the labor and related expenses may be major expenses. Such expenses may be added up to the items as follows: selling, general and administrative expenses or overhead cost in cost of sales. In a similar manner, we consider the relations between expenses for each activity and items in income statements. Table 1 shows a model of the relationships among certification activities, expenses for the activities and related items in income statements.

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Table 1. A cost model for ISO 9000 certification

2.2 Maintenance of quality system

Once a quality system is certified by ISO 9000, the next step is maintenance of the certified quality system. An example of this activity is found in a report by Hiraoka and Uetani (1994) in Matsushita Electric Components. According to the report, there are 16 business units that had been obtained certification during the period from January 1993 to December 1993. After obtaining certifications, they had started to make an integrated maintenance procedure of 16 quality system, because these quality systems were constructed independently. In these activities, a company wide committee, consisting of some full-time employee, had played a core role as an administrative organization. This report states that the maintenance activities had performed under a leadership of the administrative organization with cooperation of other departments relating to the quality system.

Other reports, such as Ikeda (1995) have shown that maintenance activities had performed under a leadership by an administrative organization with cooperation of other departments relating to the quality system, while some companies had not considered the integration of the quality systems. This fact implies that the major expenses of the maintenance may be labor and related expenses for the administrative organization and the department relating to the quality system. Furthermore, the expenses of the administrative organization may be added up to the selling, general and administrative expenses or overhead in cost of sales by the same reason in the certification cost. Table 2 shows a model of the relationships among maintenance activities, expenses on the activities and items in income statements.

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Table 2. A cost model for maintenance of certified quality system

3. Case study of cost estimation in a company

3.1 Outline

An electric equipment division, called A division, in a company had obtained certification of ISO 9001 in a couple of years ago, where the number of employee and the total sales per year in the division are approximately 300 and 100 million US\$, respectively. Due to the protection duty for the secret information, the precise values are not listed here, but the approximated values are listed. In order to estimate the certification cost based on the model shown in the previous section, Fukuda (2000) and the author performed an interview survey to a person, who is in charge of promotion of ISO 9001 certification in A division.

We estimate L_T : total labor cost of ISO 9001 certification, which is the major expenses in the model, by the following equation:

$$L_T = L \times (N_F + aN_C) \times T, \quad (3.1)$$

where L : labor expenses per employee, N_F : number of fulltime staff, N_C : number of concurrent staff, T : term of the certification activity and a is an adjustment factor to indicate the actual working terms for ISO 9001 certification activity to the whole term. Furthermore, N_F and N_C are adjusted based on the number of management staff in the estimation by Equation (3.1). Specifically, one management staff is supposed to equal 1.5 employees. The labor expenses per employee, L , is determined the Nikkei Financial Analysis, that is one of the most reliable financial data source in Japan.

3.2 Cost estimation

The estimates are calculated based on the cost model. In the following description, the actual schedule in A division is different from the schedule shown in this paper due to the protection duty for the secret information. However, length of the activities shown in this paper is as same as the actual length.

(1) Establishment of promotion and administration

The top management of the company declared trying to be certified ISO 9001 in the end of 1993. An organization for promotion and administration for certification was established in 1994 January. The role of the promotion and administration activities were mainly performed by a committee, called X committee. X committee consists of three fulltime staffs and fifteen concurrent staffs who belong to other departments. The three fulltime staffs had played a role of secretariat, such as arrangement for the employee education for certification. The meeting of X committee had been held every two month in order to decide overall schedule for ISO 9000 implementation.

In this activity, the number of fulltime staff, N_F , is determined 3.5 since one management staff was involved in X committee. As regarding the number of concurrent staffs, N_C , it is determined 22.5 since all fifteen staffs are managements. Furthermore, the adjustment factor a is determined 0.2 by the response of the staff who cooperated with our interview survey. The term of the activity, T , is 18 months. Under these conditions, the labor and related expenses of promotion and administration of ISO 9000 certification is estimated 617,000 (US\$). It is equivalent to 411,000 US\$ per year since the activity had been performed 18 month.

(2) Adjustment of existing quality system

In A division, the adjustment activities of existing quality system were mainly performed by X committee and Y committee that consists of thirteen concurrent staffs selected from various department, such as production, quality assurance and so on. X committee had prepared the common standard over the division while Y committee had prepared the standard for each department. The meeting of Y committee had been held once in a month, basically. By a similar manner, the labor expenses of adjustment of existing quality system is estimated as 2,717,000 (US\$) in 18 month, which is equivalent to 1,811,000 (US\$) per year. As regard the education fee, it is estimated 25,000 (US\$).

(3) Other activities and summary

In a similar manner, we estimated the cost for ISO 9001 certification based on the interview and the model. The estimates of the expenses are summarized in Table 3. This table indicates that the total certification cost is 3,958,000 (US\$) and it is equivalent to 2,639,000 (US\$) per year. Furthermore, the major certification expense is the labor and related expenses, for example over than 98% are the labor and related expenses. As regard the maintenance cost, it is estimated 1,133,000 (US\$) per year,

where it is calculated for one year after certification. According to the interview survey, the maintenance cost will decrease since the number of the staff in promotion and administration started to decrease.

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Table 3: Summary of certification and maintenance cost in A division

3.3 Discussion

(1) Table 4 summaries the certification cost for each activity with its lower and upper bounds. These lower and upper bounds are calculated by selecting $\alpha = 0.1$ and $\alpha = 0.35$, respectively. This table shows the difficulty of cost estimation on (ii) adjustment of existing quality system comparing to other activities, since the range between the upper and lower bounds are larger than the other activities.

This table also shows that the major activity in terms of cost is (ii) adjustment of existing quality system. In order to clarify this point, Figure 1 shows the proportion of each cost to the total cost. This figure shows that the cost of (ii) adjustment of existing quality system is the largest, which is approximately two-third to the total cost.

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Table 4 Estimated cost for each activity (1,000 US\$)

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Figure 1. Proportions of each cost to the total cost

(2) The expenses for the activity of (i) promotion and administration can be regarded as the pure expenses for ISO certification while the other cost includes other aims, for example, (ii) adjustment of existing quality system may include both the enhancement of quality system and certification. In other words, (i) promotion and administration activity will not be needed if a company does not implement ISO9000 certification. In A division, the expense for of (i) promotion and administration is 617,000 (US\$). When companies consider implementation of ISO certification activities, this cost may be a criterion in the economical aspect. In order explore precisely, we will conduct a survey in the next section.

(3) In the economical aspect, another concern for certification may the cash flow such as the examination and consultant fee. Table 1 shows that the certification and maintenance costs needed to pay by cash are 50,000 (=28,000+8,000+17,000) and 8,000 (US\$), respectively. This cost may have a large variation depending on company policies. For example, the cost is depending on whether asking for external consultation or not.

4. Case study of cost estimation for promotion and administration

As stated in the previous section, the cost for (i) administration and promotion can be regarded as the cost for the sake only ISO 9000 certification, we focus on this cost in this section. The promotion and administration cost is estimated by a survey on four major steel companies in Japan, these are Nippon Steel, Kawasaki Steel, Sumitomo Metal Industries and Kobe Steel. The main reason of the selection of steel industry is timing of their certifications. The World Wide Web page

of Japan Accreditation Board for Conformity Assessment (JAB) tells us that the numbers of registered suppliers in Japan are 74 and 6631 at the ends of 1994 and 1998, respectively. The major steel companies had started to implement certification activities relatively earlier comparing to other industries. The four steel companies had obtained certification at 71 business units during the period of 1993-1997.

In our study, Nakagawa (1999) and the author performed a telephone survey to ask the numbers of full-time and concurrent staffs who involved in each certification. We got 46 responses out of 71 business units. By the reason of protection of secret information, the original numbers of employees are not listed here.

We estimated the cost for promotion and administration for each ISO 9000s certification by using Equation (3.1), because this equation provides the cost estimates based on the numbers of full-time and concurrent staffs, the factor α and the labor expenses per employee. In this estimation, we use $\alpha = 0.20, 0.1$ and 0.35 for the central, lower bound and upper bound respectively. Table 5 summarizes the estimation results. For example, the average of estimates over 14 business units in company A is 304,700 (US\$). Furthermore, the average over all respondents is 434,200 (US\$). The comparison between Tables 3 and 5 tells us that the cost for promotion and administration may vary approximately 300,000-700,000 (US\$) per certification. Notably, the cost depends on companies, such as type of industry, company policy and so on.

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Table 5. Cost for promotion and administration for ISO 9000 certification in Steel companies. (1,000 US\$)

5. Concluding remarks

This paper, first, obtained a model that describes the major activities for ISO 9000 certification by examining some winning reports. Furthermore, the relation between the activities and items in income statements is included in the model. In terms of cost, the major activities for certification is (i) promotion and administration, (ii) adjustment of existing quality system, (iii) pre-assessment and its corrective action, (iv) assessment and its corrective action and (v) maintenance of the certified system. The model is summarized in Tables 1 and 2.

Based on the model, the cost for each activity is estimated in A division in a machinery company. This case study tells us the followings: The model shown in the above is effective for cost estimation, since it derives the cost summarized in Table 3. The major cost to the total is the labor expense for (ii) adjustment of existing quality system, where it shares approximately two-third to the total cost. The cost for (i) promotion and administration may not be negligible.

Furthermore, we focused on the cost for (i) promotion and administration because it can be regarded as a cost for the sake only certification. We estimated that the cost for (i) promotion and administration might vary approximately 300,000-700,000 (US\$) per certification. Examination of the generality of the results, in particular other industrial type, is a problem for the future research activities.

Acknowledgements

The author would like to express sincere appreciation to all companies for providing their precious data for this study. This research is supported by the Japanese Ministry of Education, Science and Culture Via Grant-in-aid for encouragement of Young Scientist 12780340.

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Table 1. A cost model for ISO 9000 certification

Activity	Expenses	Related items in income statement
(i) Promotion and administration	Labor and related expenses	Selling, general and administrative expenses Overhead in Cost of sales
	Necessary expenses	Selling, general and administrative expenses Overhead in Cost of sales
(ii) Adjustment of existing quality system	Labor and related expenses	Overhead in Cost of sales Labor cost in Cost of sales
	Education for employee	Selling, general and administrative expenses Overhead in Cost of sales
(iii) Pre-assessment and its corrective actions	Labor and related expenses	Selling, general and administrative expenses Overhead in Cost of sales Labor cost in Cost of sales
	Education for employee	Selling, general and administrative expenses Overhead in Cost of sales
	Consultation fee	Selling, general and administrative expenses Overhead in Cost of sales
	Assessment fee	Selling, general and administrative expenses Overhead in Cost of sales
(iv) Assessment and its corrective actions	Labor and related expenses	Selling, general and administrative expenses Overhead in Cost of sales Labor cost in Cost of sales
	Assessment fee	Selling, general and administrative expenses Overhead in Cost of sales

Table 2. A cost model for maintenance of certified quality system

Activities	Expenses	Related items in income statement
(v) Administration	Labor and related expenses (Administrative organization)	Selling, general and administrative expenses Overhead in Cost of sales
	Labor and related expenses (Department relating to the system)	Overhead in Cost of sales Labor cost in Cost of sales
	Assessment fee	Selling, general and administrative expenses Overhead in Cost of sales

Table 3: Summary of certification and maintenance cost in A division

Activity Major expenses	Estimates (1,000 US\$)	
	Whole	/year
(i) Promotion and administration		
Labor and related expenses	617	411
(ii) Adjustment of existing quality system		
Labor and related expenses	2717	1811
Education fee	25	17
(iii) Pre-assessment and its corrective action		
Labor and related expenses	567	378
Consultation fee	8	6
(iv) Assessment and corrective action		
Labor and related expenses	8	6
Assessment fee	17	11
Total	3958	2639
(v) Maintenance of quality system		
Labor and related expenses	1125	1125
Examination fee	8	8
Total	1133	1133

Table 4 Estimated cost for each activity (1,000 US\$)

Activity Major expenses	Estimates		
	Central	Lower	Upper
(i) Promotion and administration	617	533	792
(ii) Adjustment of existing quality system	2742	1383	4558
(iii) Pre-assessment and its corrective action	575	575	575
(iv) Assessment and corrective action	25	25	25
Total (Certification)	3958	2517	5950
(v) Maintenance of quality system	1383	367	1217

Table 5. Cost for promotion and administration for ISO 9000 certification in Steel companies. (1,000 US\$)

Company (#. Res. units)		Estimates		
		Central	Lower	Upper
A (14)	Average	304.7	187.5	480.5
	Std. Dev.	170.4	133.4	242.7
B (13)	Average	398.0	533.0	735.6
	Std. Dev.	190.3	53.4	311.0
C (10)	Average	316.8	187.0	511.6
	Std. Dev.	88.8	53.4	190.8
D (9)	Average	623.3	346.4	1038.5
	Std. Dev.	403.1	231.2	683.8
All (46)	Average	434.2	278.0	668.5
	Std. Dev.	267.2	185.3	422.3

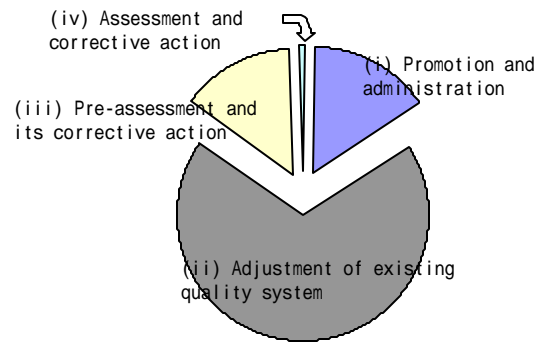


Figure 1. Proportions of each cost to the total cost