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ABSTRACT

ISO (International Organization for Standardization) management systems are represented by ISO 9001:2000. Since the establishment of the ISO 9000 series in 1984, many manufacturers in Japan that perform international transactions have adopted the ISO management systems, and now, companies in various industries, including those in the service sector, have implemented ISO management systems. The ISO 9001 system specifies operational procedures that reflect business policy, organizational characteristics, environmental factors, etc., and conformance to the international standard has been the requirement of ISO 9001 certification. In recent years, increasing importance has been attached to the effectiveness of ISO 9001 system implementation from the management perspective. In this study, we analyze the impact of ISO 9001 system implementation on operational effectiveness with management philosophy, MBO (management by objectives), management control, and management justice. We also introduce external characteristics to examine the effectiveness of ISO system implementation under the trading partners' strong/weak pressure on the company to implement the ISO system. We conducted a mail survey with corporate heads and administrative managers, and obtained 511 effective responses from 1,250 unlisted Japanese companies.

Keywords:

ISO 9001, quality management, management by objectives, survey research, Japan

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(This version is an extended summary describing our study under the constraint of 12 pages.)

Introduction

ISO (International Organization for Standardization) management systems are represented by the Year 2000 edition of the ISO 9001 quality management system (i.e., ISO 9001:2000). The ISO 9000 series was established in 1984. Since then, many manufacturers in Japan that perform international transactions have adopted the ISO management systems, and now, companies in various industries, including those in the service sector, have implemented ISO management systems. The ISO Survey indicates that as of 2006, Japan has 80,518 ISO 9001:2000 certificates, and this number is the third largest in the world, after China and between Italy and Spain (ACNielsen, 2007).

ISO management systems support business operations that utilize business policy and MBO (management by objectives) as part of their corporate philosophy. One of the requirements of ISO certification is conformance to the international standard. Increasingly in recent years, great importance has been attached to the effectiveness of the ISO management system. The system is considered effective if an organization achieves its anticipated results. In order to analyze the impact of ISO 9001 system implementation on operational effectiveness from the management perspective, we primarily consider the following two factors as the determinants of the effectiveness of the implementation of the ISO system: ISO system characteristics and management characteristics. Furthermore, we divide management characteristics into four categories: management philosophy, MBO, management control, and management justice. We also introduce another factor—external characteristics—to examine the effectiveness of ISO system implementation under the trading partners' strong/weak pressure on the company to implement the ISO system.

There are two main contributions of this study: (1) We study the relationships between four types of management characteristics and the effectiveness of ISO 9001 system implementation; (2) we also analyze the influence of the management characteristics on the effectiveness of its implementation in light of the trading partners' pressure for the company to adopt the system

Literature Review

Sila and Ebrahimpour conducted an extensive literature review of TQM (total quality management) survey research. They analyzed 347 articles published between 1989 and 2000, and many of these papers are related to the ISO 9001 series system (Sila & Ebrahimpour, 2002). Similar to our study, many recent studies on the ISO 9001 system implementation incorporated a questionnaire survey that was administered to organizations in a particular country. For example, Bhuiyan and Alam conducted a mail survey to examine the difficulties faced by firms in Canada regarding the implementation of ISO 9001:2000 (Bhuiyan & Alam, 2004). They analyzed these difficulties with respect to company size, the number of years that the company has been operating, geographical markets that the company serves, etc. Focusing on the public sector in Taiwan, Chu and Wang conducted a questionnaire survey to investigate successful ISO 9000 implementation (Chu & Wang, 2001). They found several differences between executives and employees with regard to the perceived benefits of ISO implementation. Yeung et. al. administered a questionnaire survey to companies in the Hong Kong electronics industry to analyze the effectiveness of ISO 9000 system implementation (Yeung, Lee, & Chan, 2003).

They found that organizational performance was associated with the senior managers' operational-based objectives.

In 2000, METI (Ministry of Economy, Trade and Industry) of Japan administered a questionnaire survey to 680 Japanese companies operating in China. Their main objective of adopting the ISO 9000 series was to establish quality management in their operations (METI Chugoku, 2000). Other objectives included improving the corporate image and increasing product quality. Most companies agreed that they could achieve these objectives after they implemented the ISO quality management system. Although Japanese companies, especially manufacturers, continue to advocate ISO 9000, few, if any, of the studies on the effectiveness of ISO 9001 system implementation were conducted recently. In our study, we also introduce MBO in quality management to analyze the effectiveness of the ISO system in Japanese companies.

Hypothesis Development

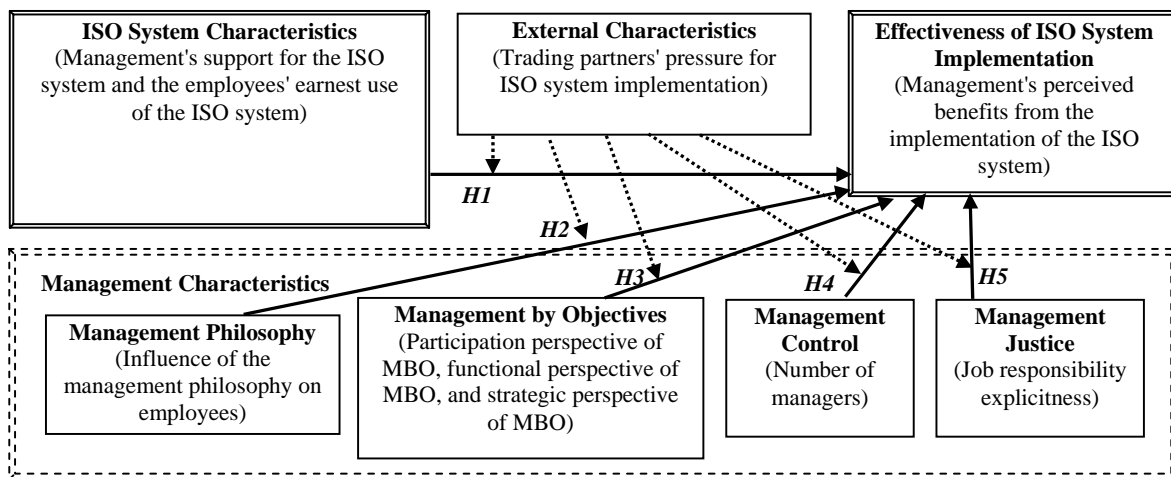
Figure 1 illustrates a conceptual model with scales in this study. We consider two dimensions that will influence the effectiveness of ISO 9001 system implementation from the management perspective: (1) ISO system characteristics and (2) management characteristics. The ISO system characteristics are measured by earnest use of the ISO system and frequent use of the ISO system. On the other hand, there are four factors of management characteristics: management philosophy, MBO, management control, and management justice.

Advocating MBO, Peter F. Drucker argued that one of its advantages is that it enables management by self-regulation instead of management by rule (Drucker, 1985). In fact, MBO is

employed as a quality objective item in the ISO 9001:2000 quality management system. It is supposed to be incorporated into general management based on TQM (total quality management) concepts. However, MBO, especially in Japan, is used in only the personnel management system governed by a company's personnel department. In Japan, there are two perspectives of MBO: a functional perspective, that is, top-down control, and a participation perspective, that is, bottom-up management. Thus, in this study, we use the participation perspective of MBO, the functional perspective of MBO, and the linkage of ISO principles to MBO.

FIGURE 1

Conceptual Model with Scales



In addition to MBO, we use management philosophy, management control, and management justice to analyze management characteristics. They are measured by the degree of the influence of the management philosophy on employees, degree of job authority, and degree of explicitness of job responsibility, respectively. Some organizations are mechanistic, while others are organic. One of the characteristics of a mechanistic management system is explicit job responsibility, which is also stipulated in the ISO management system.

The external characteristics are measured by the degree of pressure from trading partners for a company to implement the ISO system. Although the ISO 9001 system is not inter-organizational, it affects the operations of trading partners (i.e., suppliers and buyers). Thus, it is normal for trading partners to apply pressure in this regard. We also introduce the number of employees as a control variable. The control of company size is required in this study because the economies of scale will affect the effectiveness of the implementation of the ISO 9001 system.

Table 1 summarizes the scales and the number of items to measure them. We developed scale items, and thus, we conducted an exploratory factor analysis, which will be explained in the results section. All the data were obtained from the questionnaire survey except for number of employees; these numbers were obtained from the database, which will be explained in the data collection section. Based on these concepts, depicted in Figure 1, we formulated the following five hypotheses:

(From the perspective of ISO system characteristics)

Hypothesis 1. The more earnestly employees use the ISO 9001 system, the more benefits management perceives from the implementation of the ISO system.

(From the perspective of MBO)

Hypothesis 2. The more management by objectives is introduced in quality management, the more benefits management perceives from the implementation of the ISO system.

(From the perspective of management philosophy)

Hypothesis 3. The more influential the management philosophy is on employees, the more benefits management perceives from the implementation of the ISO system.

(From the perspective of management control)

Hypothesis 4. The more managers a company hires, the more benefits management perceives from the implementation of the ISO system.

(From the perspective of management justice)

Hypothesis 5. The more explicitly an employee's job responsibility is defined, the more benefits management perceives from the implementation of the ISO system.

TABLE 1
Mean and Standard Deviation of Scale Scores

Category	Scale Name	No. of Scale Items	N	Mean	Standard Deviation
ISO System Characteristics	Management's support for the ISO system	2	511	3.99	0.90
	Employees' earnest use of the ISO system	2	511	3.63	0.86
Management Characteristics	Influence of management philosophy on employees	4	511	4.45	0.63
	Participation perspective of MBO in quality management	10	511	4.21	0.57
	Functional perspective of MBO in quality management	4	511	4.59	0.49
	Strategic perspective of MBO in quality management	2	511	3.89	0.84
	Number of managers (<i>obtained from the database</i>)	1	511	N/A	N/A
	Job responsibility explicitness	2	511	3.95	0.79
Effectiveness of ISO System Implementation	Management's perceived benefits of ISO system implementation	6	510	3.77	0.62
External Characteristics	Trading partners' pressure for ISO system implementation	2	511	2.98	1.21
Control Variable	Number of employees (<i>obtained from the database</i>)	1	511	N/A	N/A

Data Collection

In the database of 4,300 Japanese unlisted companies, *Shikihou*, 1,250 companies that acquired the ISO 9001:2000 certification were identified (Toyo-Keizai, 2007). The database contains company profiles, including the company's contact information, the president's name, the number of employees, etc. We did not consider listed companies because they may have more than one ISO 9001:2000 certification; for example, each factory, each division, or each subsidiary may be ISO 9001:2000 certified. Such situations are not ideal for this study because each ISO certificate may have different characteristics.

We sent a questionnaire survey to the presidents of the 1,250 companies by mail. Almost all the questions were asked in a Likert-scale format (i.e., 1: disagree, 2: somewhat disagree, 3: neutral, 4: somewhat agree, and 5: agree). Although the recipients were not forced to answer the questionnaire survey, we received 512 responses before the first deadline. Many of the respondents requested the aggregate data from the survey; thus, their interest in the survey results increased the response rate. Only one response was not usable for data analysis due to the large number of blanks left in the questionnaire. Thus, we obtained 511 effective data points and an effective response rate of 41%.

The respondents' profiles are as follows: 54 presidents, 118 directors, 175 managers, 163 other positions, and 1 unknown position. Their authority under the ISO management system is as follows: 84 managements, 237 supervisions, 59 deputy supervisions, and 131 others (e.g., an ISO secretariat). We compared the industrial distribution of the responses across the total of 1,250 companies, using JAB (Japan Accreditation Board for Conformity Assessment) data as of July

20, 2007. JAB classifies 54,908 ISO 9001 certified organizations in Japan into 39 industries. We observed that the industrial distribution of the respondent companies was almost the same as that of the JAB data except for a few industries such as the machine and equipment industry, the construction industry, and the IT (information technology) industry. We also compared the industrial distribution of the 511 companies that responded across the 1,250 selected companies to determine if there was any response bias. However, we did not observe any large difference in the 39 industrial categories.

Results

First, we conducted factor analysis using a varimax rotation. This process is required for new scale development. As a result, we eliminated some original scales or items and created new scales or added items. Table 1 shows the mean and standard deviation of each scale. We calculated the score of each scale by computing the average of each item without imposing any weight on it. Table 1 also includes two variables that were obtained from the database rather than from the survey. They are the number of managers and the number of employees, and these variables were used to test the hypotheses.

Before we tested our hypotheses, we divided the data into two groups according to the scale score of the "trading partners' pressure for ISO system implementation." A company cannot control the external characteristics; thus, these characteristics should be taken into consideration in the evaluation of the effectiveness of the ISO system. In one group, the scale score was 3 and above, and the companies belonging to this group were pressured strongly by their trading partners to implement the ISO system. In the other group, the scale score was less than 3, and the

companies in this group received weak pressure from their trading partners. A t-test indicated that the means of the scale score of "management's perceived benefits of ISO system implementation" are significantly different in the two groups at the 0.1% significance level, as shown in Table 2. Thus, it is reasonable to categorize the data according to the degree of the trading partners' pressure.

TABLE 2

Trading Partners' Strong/Weak Pressure Regarding ISO System Implementation

	Scale score of "Trading Partners' Pressure for ISO System Implementation"	Scale score of "Management's Perceived Benefits of ISO System Implementation"		
		N	Mean	Standard Deviation
Trading Partners' Strong Pressure for ISO System Implementation	3 or more	262	3.85	0.633
Trading Partners' Weak Pressure for ISO System Implementation	Less than 3	248	3.67	0.593

Table 3 summarizes the results of the hypothesis testing at the 5% significance level. Hypotheses 1 and 3 are supported, while Hypotheses 2 and 4 are rejected. This means that employees' earnest use of the ISO system, and management philosophy that is influential to employees lead to management's perceived benefits from ISO system implementation. In addition, Hypothesis 5 is supported only under high pressure from trading partners. This means that the management has to stipulate the employees' job responsibility well under high pressure for the ISO 9001 system adoption from the trading partners in order to benefit from the system implementation.

In Hypothesis 2, our further study shows that both the participation perspective of MBO and the strategic perspective of MBO are positively related to management's perceived benefits from the implementation of the ISO system at a significance level under low pressure from trading partners. Similarly, only the participation perspective of MBO is positively related to management's perceived benefits at a significance level under high pressure from trading partners. Thus, only the participation perspective of MBO is positively related to management's perceived benefits, regardless of the level of pressure applied by the trading partners. This implies that bottom-up management is a key to effective ISO system implementation in Japan. In fact, Toyota, the largest car manufacturer in Japan, also emphasizes bottom-up management rather than top-down strategic management.

TABLE 3
Summary of Hypothesis Testing Results

Hypothesis	Trading partners' pressure for the implementation of the ISO system	Test Results	
		Supported	Rejected
H1: The more earnestly employees use the ISO 9001 system, the more benefits management perceives from the implementation of the ISO system. (<u>ISO System Characteristics Perspective</u>)	Weak	×	
	Strong	×	
H2: The more management by objectives is introduced in quality management, the more benefits management perceives from the implementation of the ISO system. (<u>MBO Perspective</u>)	Weak		×
	Strong		×
H3: The more influential to employees the management philosophy is, the more benefits management perceives from the implementation of the ISO system. (<u>Management Philosophy Perspective</u>)	Weak	×	
	Strong	×	
H4: The more managers a company hires, the more benefits management perceives from the implementation of the ISO system. (<u>Management Control Perspective</u>)	Weak		×
	Strong		×
H5: The more explicitly the employees' job responsibility is defined, the more benefits management perceives from ISO system implementation. (<u>Management Justice Perspective</u>)	Weak		×
	Strong	×	

Conclusions

The results show that regardless of the level of pressure for the ISO 9001 system adoption applied by the trading partners, employees' earnest use of the ISO system, and management philosophy that is influential to employees lead to management's perceived benefits from ISO system implementation. In addition, the participation perspective of MBO leads to management's perceived benefits from ISO 9001 system implementation, which implies the bottom-up management is crucial to effective ISO system implementation. Another implication from this study is that the management has to stipulate the employees' job responsibility well under high pressure for the ISO 9001 system adoption from the trading partners in order to benefit from the system implementation.

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