World Academy of Science, Engineering and Technology
International Journal of Economics and Management Engineering
Vol:1, No:6, 2007

Impact of ISO 9000 on Time-based Performance: An Event Study

Chris K. Y. Lo, Andy C. L. Yeung, and T. C. Edwin Cheng

***Abstract*—**ISO 9000 is the most popular and widely adopted meta-standard for quality and operational improvements. However, only limited empirical research has been conducted to examine the impact of ISO 9000 on operational performance based on objective and longitudinal data. To reveal any causal relationship between the adoption of ISO 9000 and operational performance, we examined the timing and magnitude of change in time-based performance as a result of ISO 9000 adoption. We analyzed the changes in operating cycle, inventory days, and account receivable days prior and after the implementation of ISO 9000 in 695 publicly listed manufacturing firms. We found that ISO 9000 certified firms shortened their operating cycle time by 5.28 days one year after the implementation of ISO 9000. In the long-run (3 years after certification), certified firms showed continuous improvement in time-based efficiency, and experienced a shorter operating cycle time of 11 days than that of non-certified firms. There was an average of 6.5% improvement in operating cycle time for ISO 9000 certified firms. Both inventory days and account receivable days showed similar significant improvements after the implementation of ISO 9000, too.

***Keywords*—**ISO 9000, Operating Cycle, Time-based efficiency.

I. Introduction

ISO 9000 is a meta-standard for quality management (QM) and it has been adopted by hundreds of thousands companies worldwide. Since its introduction, ISO 9000 has become the passport of the global business [1] and a basic requirement for government tenders in many countries. ISO 9000 has been diffused into different business networks and supply chains. Although much research has been conducted about the organizational impacts of ISO 9000, there are few conclusive results.

Given the controversy over registration's actual benefits, the number of new ISO 9000 registration is still increasing. The number of ISO 9000 certified companies keeps rising, sustaining an annual growth rate of about 20%. Other industry specific QM standards, such as QS 9000, TL 9000, ISO 13485, have been developed to fulfill growing demands for meta-standards in different industries. Through standardization and systemization as a result of ISO 9000 adoption, the operational procedures of the adopting company should be more efficiency. Many companies perceive that implementing ISO 9000 can improve operational performance. Despite the perceived benefits of improvement in operational efficiency, a number of critics argue that the extra documentation efforts required by ISO registration are time-consuming, and ISO adoption provides no real benefits to business performance [2-4].

The aim of this study is to provide empirical evidence on the impact of ISO 9000 on operational performance. We carried out an event study and compared ISO 9000 certified with non-ISO 9000 certified firms by controlling industry type, firm size and pre-event performance. We compared changes in specific aspects of operational performance of each sample firm with those of a portfolio of control firms that fitted our matching criteria.

We used operating cycle, number of inventory days and number of account receivable days as time-based performance indicators. We found that ISO 9000 certified firms' time-based efficiency improved significantly after certification compared with non-ISO 9000 certified firms. In the long-run, the operating cycle time gradually decreased in ISO 9000 certified firms, which was 11 days shorter than that of non-ISO 9000 certified firms. This finding provides empirical evidence that ISO 9000 is associated with the time-based efficiency of a manufacturing company.

II. Literature Review and Hypothesis Development

ISO 9000 was developed by the International Organization for Standardizations (ISO) in 1987. The number of ISO 9000 registered sites has increased dramatically since its introduction. The number of registered sites reached 776,608 at the end of 2005, representing a growth of 17.6% from the previous year. ISO 9000 underwent a major revision in 2000, and the new version emphasizes continuous improvement of quality. The number of ISO 9000 certified sites dropped during the transition period when the old standard of ISO 9000:1994 was phased out, but increased dramatically after the introduction of the new version (Fig. 1).

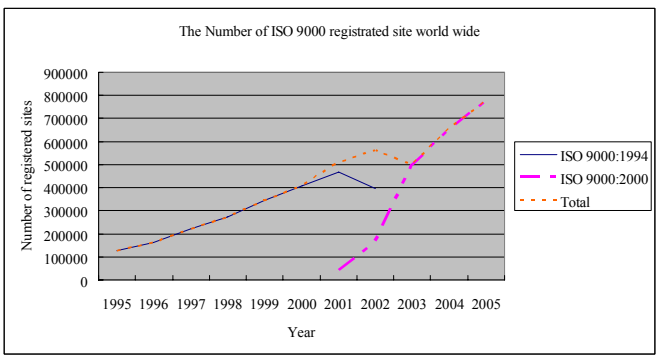

Fig. 1 The growth of ISO 9000 worldwide

TABLE I
THE NUMBER OF ISO 9000 REGISTERED SITES WORLD WIDE
SOURCE: [5-7]

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
ISO 9000:1994	127349	162701	223299	271847	343643	408631	466228	394623			
ISO 9000:2000							44388	167124	497919	660132	776608
Total	127349	162701	223299	271847	343643	408631	510616	561747	497919	660132	776608

ISO 9000 is the most popular meta-standard with a focus on operational efficiency. Through standardization and continuous improvements in processes and procedures, ISO 9000 is assumed to improve operational efficiency throughout the organization [8]. Most academics [9, 10] believe that ISO 9000 improves quality and overall efficiency in organizations, and enables them to make uniform products and to have a competitive edge, resulting in greater customer satisfaction and market share.

Most of the early studies on ISO 9000 were focused on the perceived benefits of ISO adoption by surveying practitioners (e.g., [2, 8, 11]. The majority of these studies suggested that the adoption of ISO 9000 improves operational and marketing performance. However, little empirical research has been done using objective data, except Naveh and Marcus [12] and Corbett, Montes-Sancho and Kirsch [13]. Nevertheless, Corbett, Montes-Sancho and Kirsch's research only used data from 1990 to 1997 and did not focus on time-based efficiency, while Naveh and Marcus's (2005) study did not examine the impact of ISO adoption on operational performance. This study aims at filling this existing gap by investigating the impact of ISO 9000 on adopting firms' operational performance based on objective data, which cover the period of 1990-2005.

One of the most important performance indicators in the manufacturing industry is time-based efficiency. For a manufacturing firm, time-based efficiency embraces the timeliness of delivery, manufacturing lead time, etc. [14, 15]. To measure these indicators objectively, we use an accounting-based indicator – operating cycle time.

ISO 9000 was developed based on the basic principles of quality management. The conceptual and empirical foundations for the link between improved quality and business performance are well established according to various ground theories [16, 17]. ISO 9000 requires the firm to design procedures to ensure that quality is constantly measured and appropriate corrective actions are taken whenever defects occur. Therefore, the defect rate should decrease and defects should be detected and corrected early [13], and less scrap and rework need to be handled in the manufacturing processes [12]. As a result, the overall time required to fulfill a customer order in certified firms should be shorter than that in firms without similar QM systems. Moreover, during the implementation of ISO 9000, all manufacturing procedures would have been reviewed and non-value added tasks eliminated. Therefore, we hypothesize that the time required to convert raw materials into products (i.e., inventory days) is shorter after the implementation of ISO 9000.

Hypothesis1: The adoption of ISO 9000 leads to lower inventory days.

The perceived benefits of ISO 9000 are not just confined to improving product quality, but also enhancing customer service [11]. If the implementation of ISO 9000 can improve product quality and customer service, the time required to fulfill customer orders should be faster. If there is any quality problem in product manufacturing, payment would be postponed as defective products are returned for reworking. Customers may not pay for the products until the quality problem is resolved. In order words, the time between product delivery and customer payment should be shorter for companies with higher product and service quality. This hypothesis can be examined by measuring the account receivable days.

Hypothesis 2: The adoption of ISO 9000 leads to lower account receivable days.

In the manufacturing industry, operating cycle time consists of manufacturing time (the time required to turn raw materials into products), delivery time (the time required to deliver products from the manufacturer to customers) and payment fulfillment time (the time required for customers to pay for their accepted products). The total time incurred in the above processes is known as operating cycle or "cash-to-cash cycle" [18]. Therefore, we hypothesize that operating cycle time should be shorter after the implementation of ISO 9000.

H3: The adoption of ISO 9000 leads to a shorter operating cycle.

In short, we summarize the accounting terms introduced above as follows:

Operating cycle = Number of inventory days + Number of account receivable days

$$OC = I + AR$$

I – Number of inventory days
AR – Number of account receivable days
OC – Operating cycle

Number of inventory days

$$I = \frac{365}{IT}$$

I – Number of inventory days
IT – Inventory turnover ratio

$$IT = \frac{COGS}{Avg.Inv.}$$

COGS – Cost of good sold
Avg.Inv. – Average inventory balance

Number of receivable days

$$AR = \frac{365}{ART}$$

AR – Number of account receivable days
ART – Account receivable turnover ratio

$$ART = \frac{CS}{Avg.AR}$$

CS – Credit sales
Avg. AR – Average account receivable balance

III. Data Collection

We selected manufacturing companies (SIC code 2000 – 3999) that are listed in the stock markets in North America, as ISO 9000 is most commonly adopted in this industry. The stock markets in the U.S. and Canada are well-established with adequate financial information for our investigations. The companies' financial information is available in the COMPUSTAT database from Standard and Poor's. There are 3,642 active manufacturing companies in the database.

ISO 9000 Information

To identify ISO 9000 certified firms and their years of certification, we collected ISO 9000 registration data from two online databases, which are www.qualitydigest.com and www.whosregistered.com. From these two databases, we searched by company names to find out the date of each certification and the plants/sites that were certified. However, each company could have multiple plants/sites being certified. Following the practice of previous research [12, 13, 19], we only focused on the first ISO 9000 certification. After compiling the data from the online databases, we found that 1,104 out of 3,642 (30.31%) listed manufacturing firms in North America were ISO 9000 certified. The distribution of the year of certification is shown in Table II.

TABLE II
Distribution of the Year of Certification

	ISO 9000	
Year	**No. of firms**	**% of Firms**
1990	4	0.36
1991	8	0.72
1992	42	3.80
1993	82	7.43
1994	112	10.14
1995	101	9.15
1996	120	10.87
1997	102	9.24
1998	85	7.70
1999	71	6.43
2000	72	6.52
2001	50	4.53
2002	79	7.16
2003	112	10.14
2004	35	3.17
2005	29	2.63
	1104	**100.00**

Financial Information

Operational and financial information was obtained from Standard and Poor's COMPUSTAT North America database. The COMPUSTAT database is considered to be a very useful source of archival financial information for studying business and corporate strategies [19]. The coverage of the financial data of each firm is 1988 to 2005.

IV. Event Study Methodology

In order to reveal any causal relationship between the adoption of ISO 9000 and operational performance, we adopted event study in this research. We largely followed the guideline suggested by Barber and Lyon [20] for detecting abnormal performance between sample and control firms. The event period studied in this research was the period during which ISO 9000 was implemented. To pass the ISO 9000 audit, the average preparation time is 6-18 months prior registration [13]. Since the preparation and auditing periods typically take at least half a year, we used "year" as the time unit in our event windows. The year of registration was used as the focal point time *t*. The year before registration date was *t – 1*. Therefore, the time before ISO 9000 implementation was taken as *t - 2*. We were also interested in the long-term impact of ISO 9000, so we looked into the financial data for the next three years after ISO 9000 certification (i.e., *t+1*, *t+2* and *t+3*).

Matching Sample and Control Firms

We adopted the event study methodology and eliminated confounding factors other than the event of ISO 9000 certification. We carefully matched sample and control pairs based on specific matching criteria. Sample groups are companies that experienced the event (i.e., obtaining the first ISO 9000 registration), while control group companies are free from the impact of that event. Sample and control groups companies have to be in the same industry with similar firm size, and pre-event performance, so as to minimize the confounding factors in a particular industry or due to the overall economy status. Moreover, we matched the sample firm with a portfolio of control firms that fit the matching criteria, so as to minimize performance fluctuations that might happen in a particular control firm.

In our study we matched the sample firms' and control firms' industry type by the SIC code. In general, matching the same first two digits of SIC code ensures that highly similar industries are selected. The purpose of having this matching criterion is to eliminate any industry specific effects during the event period. Firm size was also controlled as large corporations may have more resources for quality improvements [21]. Following Hendricks and Singhal's [21] event study on TQM implementation, we used 33 - 300% of total asset, a factor of three, as our firm size matching criterion.

Barber and Lyon [20] suggested that matching pre-event performance is the most critical factor for event study. They found that matching industry type (two digit SIC code) and 90 - 110% pre-event performance create the most appropriate matching groups between sample and control firms. Accordingly, we matched the sample and control firms with two digit SIC code, 33 - 300% firm size (total asset), and 90 - 110% pre-event operating cycle time. In case some sample firms could not match any control firms based on two digit SIC code, firm size and pre-event performance, we loosened the

matching criteria to increase the sample size [12, 21-23]. In short, the matching steps are as follows:

Step 1 – Two digit SIC code + 33 - 300% Total Asset + 90 - 110% abnormal performance

Step 2 – One digit SIC code + 33 - 300% Total Asset + 90 - 110% abnormal performance

Step 3 – 33 - 300% Total Asset + 90 - 110% abnormal performance

Data Analysis

The statistical tests commonly used in event studies are the paired-sample t-test (parametric), Wilcoxon Signed Ranks (WSR) test and Sign test. If the abnormal performance follows a normal distribution, the parametric sample t-test is generally valid. We examined the data for normality by using the Kolmogorov-Smimov test and the Shapiro-Wilk test. If the abnormal performance of the sample firms is not normally distributed, the non-parametric WSR test and Sign test should be used. We trimmed out the top and bottom one percentile records to avoid outliners. Table III shows the descriptive statistics of the sample and control firms. The average length of the operating cycle of the sample firms was 169.4 days. The average length of inventory days and account receivable were 105.56 days and 63.83 days, respectively. Inventory day was 62.3% of the total operating cycle, while account receivable day was 37.7% of total operating cycle.

TABLE III
DESCRIPTIVE STATISTICS OF THE SAMPLE AND CONTROL FIRMS

	N	Mean	Median	St. dev.	Min.	Max.
Sample firms						
Total asset[a]	695	2164.36	232.75	6839.38	0.25	92485.27
Operating cycle[b]	695	169.40	150.44	98.60	34.64	1216.73
Inventory days[b]	695	105.56	86.89	85.22	4.29	1067.54
Account receivable days[b]	695	63.83	57.78	30.76	3.51	466.32
Control firms						
Total Asset[a]	695	1676.63	228.67	4335.00	0.44	56030.00
Operating cycle[b]	695	168.13	151.18	96.29	33.43	1121.60
Inventory days[b]	695	105.76	88.72	83.42	6.97	1006.12
Account receivable days[b]	695	62.38	59.23	26.07	9.58	366.93

[a]Total asset is in million US$.
[b]Operating cycle, inventory days and account receivable are in terms of days

V. RESULTS AND DISCUSSION

We tested the hypotheses by examining whether ISO 9000 certified firms had abnormal performance in terms of operating cycle, inventory days and account receivable days. The corresponding statistical tests results of operating cycle, inventory days and account receivable days are shown in Table 3, 4 and 5, respectively. The column "From year" depicts the event window periods of change in performance, while *t* was the year that the sample firms obtained the first ISO 9000 certification. The column "N" contains the sample size of that event window period, and "AP Mean" and "AP Median" show the abnormal performance of the indicators. Although we matched the sample and control firms based on the performance in *t*-2 year, we also reported the *t*-3 to *t*-2 year data in the first row to see if there was any systematic bias prior to the sample firms' decision to implement ISO 9000. The second row "*t*-2 to *t*-1" shows the abnormal performance of the sample firms immediately after implementing ISO 9000. Since all the performance data of the sample and control firms are non-normal, non-parametric tests provide more reliable results.

TABLE IV
THE ABNORMAL PERFORMANCE OF OPERATING CYCLE; PORTFOLIO MATCHING, BY INDUSTRY, TOTAL ASSET, AND OPERATING CYCLE

From year	N	AP Mean	AP Medium	*p*-value (t-test)[a]	*p*-value (WSR Test)[a]	*p*-value (Sign Test)[a]
t-3 to t-2	650	-0.4690	1.2042	0.4135	0.1430	0.1635
t-2 to t-1	695	-5.2861	-5.4915	0.0900**	0.0000***	0.0000***
t-1 to t	682	-0.3780	-1.4538	0.4665	0.0540**	0.1690
t to t+1	652	-6.0636	-0.6749	0.1010	0.4795	0.4530
t+1 to t+2	620	-2.4586	0.7034	0.2685	0.3340	0.3010
t+2 to t+3	534	-2.6932	-1.5109	0.2395	0.1390	0.3485
t-2 to t	683	-6.9016	-7.2576	0.0270**	0.0000***	0.0000***
t-1 to t+1	648	-4.7567	-0.6976	0.0995**	0.2720	0.3050
t-1 to t+2	622	-5.0027	-2.3325	0.1425	0.0915**	0.1395
t-1 to t+3	536	-6.7931	-3.5919	0.0725**	0.0110**	0.1050
t-2 to t+1	657	-7.7608	-6.9308	0.0245**	0.0000***	0.0000***
t-2 to t+2	624	-9.2477	-8.2144	0.0010***	0.0000***	0.0000***
t-2 to t+3	537	-11.0784	-8.9216	0.0005***	0.0000***	0.0000***

$p < 0.1$; $**p < 0.05$; $***p < 0.01$.
[a]The *p*-value shown are one-tailed test of null hypothesis of no abnormal performance.

Table IV shows that, the abnormal performance of operating cycle was found in the first year of ISO 9000 implementation. We found that most significant improvement appeared in the "*t-2* to *t-1*" period as both WSR and Sign tests show strong and significant results. Certified firms had 5.28 days shorter in operating cycle in the first year after the implementation of ISO 9000. For the period "*t-1* to *t*", there was moderate improvement in operating cycle as the magnitude was smaller compared to "*t-2* to *t-1*". The total decrease in operating cycle in the first two years of ISO 9000 implementation (i.e., the "*t-2* to *t*" period) was 6.7 days.

Table IV also shows that the pattern of continuous improvement after certification. The abnormal performance in the period "*t-2* to *t+1*", "*t-2* to t+2" and "*t-2* to *t+3*" was gradually improving, meaning that operating cycle was getting shorter annually. In the period *t+3* year, certified firms

improved their time-based efficiency by trimming 11.07 days from their operating cycle. These results clearly show that the implementation of ISO 9000 improves overall time-based efficiency and the effect is enduring in long run. Therefore, hypothesis H3 was fully supported.

TABLE V
THE ABNORMAL PERFORMANCE OF NUMBER OF INVENTORY DAYS; PORTFOLIO MATCHING, BY INDUSTRY, TOTAL ASSET, AND OPERATING CYCLE

From year	N	AP Mean	AP Medium	*p*-value (t-test) [a]	*p*-value (WSR test) [a]	*p*-value (Sign test) [a]
t-3 to t-2	650	-1.4990	1.4163	0.3110	0.1825	0.0195**
t-2 to t-1	695	-3.6813	-3.8040	0.1260	0.0000***	0.0000***
t-1 to t	682	0.5199	-1.2339	0.4530	0.0190**	0.0065***
t to t+1	652	-1.0545	-0.2831	0.3490	0.4600	0.2785
t+1 to t+2	620	-2.4689	-0.9574	0.2150	0.2240	0.0800**
t+2 to t+3	534	-2.6631	-0.3722	0.2040	0.1275	0.3975
t-2 to t	683	-3.8199	-3.8102	0.1010	0.0000***	0.0005***
t-1 to t+1	648	-4.6980	-1.2180	0.0600*	0.0735*	0.0385**
t-1 to t+2	622	-4.8065	-2.2039	0.1245	0.0230**	0.0295**
t-1 to t+3	536	-6.2157	-2.5411	0.0550*	0.0130**	0.0420**
t-2 to t+1	653	-5.5278	-4.4195	0.0465**	0.0000***	0.0000***
t-2 to t+2	624	-7.0616	-5.5638	0.0030***	0.0000***	0.0000***
t-2 to t+3	537	-8.7449	-5.2435	0.0030***	0.0005***	0.0005***

$p < 0.1$; $**p < 0.05$; $***p < 0.01$.
[a]The *p*-value shown are one-tailed test of null hypothesis of no abnormal performance.

Table V shows the abnormal performance of inventory days. Inventory days comprised of 62.3% of the total operating cycle. As expected, the results show a similar pattern to the overall abnormal change in operating cycle. In the periods "*t*-2 to *t*-1", "*t*-1 to *t*" and "*t*-2 to *t*", the results show that there was a significant improvement in inventory days. This implies that the time required to manufacture a product from raw materials was 3.8 days shorter in ISO 9000 certified firms than in non-certified companies. The long-run continuous improvement pattern is also clear from results of inventory days. As shown in the periods of "*t*-2 to *t*+1", "*t*-2 to *t*+2" and "*t*-2 to *t*+3", the length of inventory days decreased gradually in ISO 9000 certified firms. Therefore, hypothesis H2 was supported, too.

TABLE VI
THE ABNORMAL PERFORMANCE OF NUMBER OF ACCOUNT RECEIVABLE DAYS; PORTFOLIO MATCHING, BY INDUSTRY, TOTAL ASSET, AND OPERATING CYCLE

From year	N	AP Mean	AP Medium	*p*-value (t-test) [a]	*p*-value (WSR test) [a]	*p*-value (Sign test) [a]
t-3 to t-2	650	1.3320	0.7331	0.0770*	0.0375**	0.1540
t-2 to t-1	695	-1.6770	-1.2711	0.0965*	0.0080***	0.0155**
t-1 to t	682	-1.2850	0.0089	0.0785*	0.3520	0.5000
t to t+1	652	-4.7400	1.5815	0.1020	0.0025***	0.0045***
t+1 to t+2	620	-1.4919	1.4065	0.2965	0.0190**	0.0460**
t+2 to t+3	534	-3.0241	0.6285	0.1450	0.3560	0.2065
t-2 to t	683	-3.5423	-1.9926	0.0020***	0.0035***	0.0035***
t-1 to t+1	648	-0.0297	1.0969	0.4870	0.0580*	0.0325**
t-1 to t+2	622	-2.1178	0.8776	0.2070	0.2515	0.1315
t-1 to t+3	536	-2.2246	1.2251	0.1050	0.4705	0.1410
t-2 to t+1	653	-2.4456	-0.7954	0.0350**	0.1700	0.1740
t-2 to t+2	624	-4.1829	-0.0530	0.0440**	0.1200	0.5000
t-2 to t+3	537	-4.0328	-1.2372	0.0050***	0.0275**	0.1320

$p < 0.1$; $**p < 0.05$; $***p < 0.01$.
[a]The *p*-value shown are one-tailed test of null hypothesis of abnormal performance.

For the results on account receivable days, the pattern is similar to the results on overall operating cycle and inventory days, but the magnitude is relatively smaller. We found that in the periods of "*t-2* to *t-1*" and "*t-2* to *t*" periods, ISO 9000 certified firms experienced similar but less significant abnormal performance like the other two indicators. However, account receivable days showed a strong abnormal performance in the post certification period. In the "*t* to *t+1*" and "*t+1* to *t+2*" periods, the abnormal change in account receivable days was stronger compared with that of inventory days. This might imply that the impact on account receivable days was higher after firms obtained the certification officially. Since account receivable days might reflect the quality of the products and the delivery performance, we believe that certified firms provided customers with higher quality products and a timely manner. Hypothesis H3 was supported, too.

VI. CONCLUSION

We found that publicly listed manufacturing firms in the North America implementing ISO 9000 significantly improved the time-based efficiency of their operations. Time-based efficiency started to improve right after the implementation of the ISO 9000. We found that ISO 9000 certified firms continued to perform better in terms of overall operating cycle three years after they obtained certification. The abnormal performance of shortened account receivable days also suggests that ISO 9000 certified firms could offer better customer service and product quality.

REFERENCES

[1] M.V. Uzumeri, *ISO 9000 and other metastandards: principles for management practice?* The Academy of Management Executive, 1997. 11(1): p. 21-36.
[2] M. Terziovski, D. Samson, and D. Dow, *The business value of quality management systems certification. Evidence from Australia and New Zealand.* Journal of Operations Management, 1997. 15(1): p. 1-18.
[3] F.M. Aarts and E. Vos, *The impact of ISO registration on New Zealand firms' performance: a financial perspective.* The TQM Magazine, 2001. 13(3): p. 180-191.
[4] I. Heras, M. Casadesus, and G.P.M. Dick, *ISO 9000 certification and the bottom line: a comparative study of the profitability of Basque region companies.* Managerial Auditing Journal, 2002. 17(1/2): p. 72-78.
[5] ISO, *The ISO Survey - 2005*. 2006: Geneva.
[6] ISO, *Twelfth cycle: The ISO Survey of ISO 9000 and ISO 14001 Certificates*. 2003, ISO: Geneva.
[7] ISO, *The ISO Survey - 2004*. 2005: Geneva.

[8] S.S. Rao, T.S. Ragu-Nathan, and L.E. Solis, *Does ISO 9000 have an effect on quality management practices? An international empirical study.* Total Quality Management, 1997. 8(6): p. 335-346.
[9] S. Hill, *ISO 9000 certification provides long-term payoff.* Quality, 1996. 35(4): p. 66-68.
[10] S.A. Spreha and M.M. Helms, *ISO 9000 - a struggle well worth the effort.* Production and Inventory Management Journal, 1995. 36(4): p. 46-52.
[11] F. Buttle, *ISO 9000: marketing motivations and benefits.* International Journal of Quality & Reliability Management, 1997. 14(9): p. 936-947.
[12] E. Naveh and A. Marcus, *Achieving competitive advantage through implementing a replicable management standard: Installing and using ISO 9000.* Journal of Operations Management, 2005. 24(1): p. 1-26.
[13] C.J. Corbett, M.J. Montes-Sancho, and D.A. Kirsch, *The financial impact of ISO 9000 certification: an empirical analysis.* Management Science, 2005. 51(7): p. 1046-1059.
[14] A.C.L. Yeung, T.E. Cheng, and K.-h. Lai, *An empirical model for managing quality in the electronic industry.* Production and Operation Management, 2005. 14(2): p. 189-204.
[15] A.C.L. Yeung, T.C.E. Cheng, and L.-Y. Chan, *From customer orientation to customer satisfaction: the gap between theory and practice.* IEEE1 Transations on engineering management, 2004. 51(1): p. 85-97.
[16] W.E. Deming, *Out of the Crisis: Quality, Productivity and Competitive Position*. 1986, New York: Cambridge University Press.
[17] R. Reed, D.J. Lemak, and N.P. Mero, *Total quality management and sustainable competitive advantage.* Journal of Quality Management, 2002. 5(1): p. 5-26.
[18] R.K. Eskew and D.L. Jensen, *Financial Accounting*. Firth Edition ed, ed. M.E. Cox, T. Vareris, and P. Rehberger. 1996, New York: The McGraw-Hill Companies, Inc.
[19] B.L. Simmons and M.A. White, *The relationship between ISO 9000 and business performance: does registration really matter?* Journal of Management Issues, 1999. 11(3): p. 330-343.
[20] B.M. Barber and J.D. Lyon, *Detecting abnormal operating performance: the empirical power and specification of test statistics.* Journal of Financial Economics, 1996. 41: p. 359-399.
[21] K.B. Hendricks and V.R. Singhal, *Does implementing and effective TQM program actually improve operating performance? Empirical evidence from firms that have won quality awards.* Management Science, 1997. 43(9): p. 1258-1274.
[22] K.B. Hendricks and V.R. Singhal, *The long-run stock price performance of firms with effective TQM programs.* Management Science, 2001. 47(3): p. 359-368.
[23] K.B. Hendricks and V.R. Singhal, *Quality awards and the market value of the firm: an empirical investigation.* Management Science, 1996. 42(3): p. 415-436.