แนวทางการประยุกต์ใช้ระบบบริหารคุณภาพ: ประสบการณ์จากอุตสาหกรรมผู้ผลิตชิ้นส่วนยานยนต์ในประเทศไทย

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บทคัดย่อ

การศึกษานี้มีวัตถุประสงค์เพื่อที่จะสำรวจความก้าวหน้าในการนำระบบบริหารคุณภาพเข้ามาใช้เพื่อเป็นแนวทางในการพัฒนาระบบการบริหารงานให้สอดคล้องกับมาตรฐานสากล ISO9000 การศึกษานี้จะอาศัยข้อมูลจากอุตสาหรรมการผลิตชิ้นส่วนยานยนต์ซึ่งจัดได้ว่าเป็นอุตสาหกรรมหนึ่งของประเทศที่มีความก้าวหน้าในการพัฒนาระบบบริหารคุณภาพตามมาตรฐานสากลการศึกษานี้ใช้ระเบียบการวิจัยเชิงสำรวจที่เป็นระบบซึ่งครอบคลุมประเด็นการสำรวจที่สำคัญได้แก่ สถานการณ์ปัจจุบันในการประยุกต์ใช้มาตรฐานระบบบริหารคุณภาพ วัตถุประสงค์ของการประยุกต์ใช้ แนวทางการบริหารโครงการ ตลอดจนปัญหาและอุปสรรคที่พบ ผลการศึกษาซึ่งมีความสอดคล้องกับงานวิจัยอื่นที่มีลักษณะเดียวกันสามารถใช้เป็นแนวทางให้บริษัทต่าง ๆ นำไปใช้เพื่อพัฒนาระบบบริหารคุณภาพสำหรับรองรับมาตรฐานสากลต่อไป

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Implementation of Quality Management System: Experience from the Thai Automotive Industry

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Abstract

The purpose of this study is to carry out an investigation of the progress made in the development of a quality management system to meet the international standards according to ISO9000 series. Thai automotive industry being the most successfully certified by an accreditation body will be surveyed. A systematic study is conducted on the current status of ISO9000 series, the profile of the certified companies, motivation and experience to deal with the project management are also discussed. Because of the growth in quality management system in many sectors of Thai industry, there has until now been a few such study. However, the findings of this study are quite similar to the previous study conducting in Thailand and other countries.

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1. Introduction

At present, more than 90 countries, including UK, USA, Japan, Australia, have been implemented the ISO9000 series as their national quality standard [1]. In most cases, these national standards are identical to the ISO9000 series. ISO9000 standard were also originally adopted in Europe as EN29000 and now has been redesigned EN29000. Any mandatory requirement for quality system within European Community directives will refer to this standard. However, careful study of ISO9000: 1994 in recent year by certain majors groups of user or potential users identified a number of needs that are not easily met by this standard. Some user felt that this version should be modified to take a maximum advantage for both customers and suppliers. As the results, the third edition of ISO9000 series naming ISO9001: 2000 has been established since December 15, 2000 [2]. This version is more likely similar to the many national quality awards, which were derived from the concept or philosophy of total quality management [3]. This paper consists of five sections. Next section summarizes the infrastructure of the Thai automotive industry. Research methodology including survey method and data analysis is described in section 3. Section 4 and 5 explains research findings and conclusions respectively.

2. The Infrastructure of Thai Automotive Industry

Thailand's automotive industry was born some 36 years ago [2]. At that time, the main objective is to protect the import from foreign. Foreign investment was highly protected under the Foreign Investment Promotion Act of 1960. The protection and privileges were in the forms of high import tariffs imposed on or a ban on some CBU cars. Under Thai laws, CKD units assembled in Thailand are required to use a sizable number of local parts and accessories. The aims of these requirements were to develop the part and accessory industry in the country, hence boosting local employment. As of 1996, 13 automobiles assembly plants in Thailand had production capacity of over 607,000 units per year. Three plants: Toyota Motor, MMC (Mitsubishi Motor Corp.) Sithiphol and Isuzu Motor account for more than half of the total output. Honda Cars, Ford Motors and General Motor, are building assembly plants which will have a combined output of more than 300,000 units/annum. These expansions are aimed for domestic market as well as for export.

In order to deal with this growth and the investment of foreign assemblers such as the Big Three, Parts/components manufactures in Thailand have to develop their production system, human resources and quality management system. ISO9000: 2000 is now world wide recognized in the international markets and being the first step of the company to serve the specific requirement in Big

Three Automobile industries, QS9000: 1998 and ISO/TS 16949: 2002 [2]. The total number of Thai assemblers, parts/components manufacturers are approximately 625 companies including 18 assemblers companies [2]. Up to now, almost 200 companies have been certified by either ISO9000 (ISO9001/2/3: 1994 or ISO9001: 2000) or QS9000: 1998 standard. Most of them are joint venture companies. This finding leads to establish the following research questions:

- What are the reasons in adopting of the international standard of quality management system?,
- How can the Thai assembler, parts/components manufacturing companies' success in adoption and implementation of the international standard?, and
- What are the problems in implementing quality management system standard?

The experiences from 114-quality management system certified company (ISO9001/2/3: 1994, ISO9001: 2000, and QS9000: 1998) could be contributed to these questions.

3. Research Methodology

The research methodology in this study was to assess the impacts and experiences of quality management system standard in the companies that have been certified by registration bodies. Success factors, problems or difficulties for implementation, and project management will be surveyed. The environment in which this study was carried out was the company in Industrial standard code ISIC 34/35 that have been certified by ISO9000 series standard. Data in http:///www.tisi.go.th generated the samples in this study. The reason for focusing on the motor vehicles, transport equipment industry because the number of companies who were certified has dramatically increase. In addition, this industry has to develop their quality management system that can be served the higher standard such as ISO/TS16949: 2002 in the near future.

3.1 Survey method

A self-administered questionnaire was used to conduct the survey. Initial design of the question, which was consisted of twenty-two questions, was based on a review of available related literatures and previous studied. After several revisions, a final draft was designed after pre-tested by twenty undergraduates engineering students and conducting interviews with two companies that were currently implementing ISO9000 series. The questionnaire was mainly divided into three parts: adoption, implementation and post-implementation of ISO9000 series standard. Only the quality assurance or quality control managers who have strategic decision-making responsibilities and who

also can provide the nature of information sought process information about the companies' quality system. The project champion as quality management representative (QMR) was regarded as belonging to this group. After mailing of 120 companies, 114 usable with a response rate of 95% approximately.

3.2 Data analysis

The data from one-hundred and fourteen questionnaires were entered in to a spreadsheet on SPSS. The weight scale from 1(the most important) to 5(the least important) in each question was used to compare between the question. Then, *t*-test and *Chi-Square (Cross-tabulation)* were used to determine the statistical significant different between SME and large company in adoption, implementation, and post-implementation evaluation activities of ISO9000. The reliability of all weight scales using in this study was tested by using Cronbach's alpha [10]. A value greater than 0.6 was treated acceptable [11].

The results of survey indicate that most of respondents are classified into small-to-medium company/enterprise (SME) with 85.96%. Only 14.04% of respondent are classified into large company. Table 1 exhibits the summary data.

Table 1 Company profile

Company size[1]	Responsedent	%
$\leq$ 200 workers (SME)	98	85.96
$>$ 200 workers	16	14.04
Total	114	100.00

[1] Size classification according to Ministry of Industry, Thailand.

4. Research Findings

4.1 Intensity of technology

According to the classification of technologies that are proposed by Suresh and Meredith [6], most of respondents companies, approximately 84.62%, have a low level of automated. It means that all of them use stand-alone technology for example: computer-aided design, computer-aided manufacturing, and computer numerical control. Only 10 respondents, approximately 8.77 %, used an intermediate technology system for example automated material handling system and automatic storage and retrieval system (AS/RS).

4.2 Adoption of ISO9000 series

4.2.1 The quality management activities:

From 114 respondents, 80 companies, approximately 70%, have been implemented 5S activity. The rest have been implemented statistical process control (15.38%), Kanban system (7.69%) and Quality Control Circle (7.26%). None of them have implement JIT and TQM activity prior to introduce ISO9000 series standard. These quality management activities could be used as fundamental activities before adopting the standard for quality management system [3][4].

4.2.2 The reason for adopting ISO9000

It is important to note that the major factors to attain ISO9000 international standard registration come from pressure by a large company in their supply chain. In Table 2, the result indicates that three main reasons for adoption ISO9000 series are improving product quality, market needs or the competitors driven and corporate strategy or policy. In addition, the result of *t*-test indicates that large company more considers in 3 out of 8 reasons for adopting ISO9000 than SME significantly. These are corporate strategy/policy, improve employee capability, and plan to implement Total Quality Management (TQM).

Table 2 Reason for adopting ISO9000

Reason for adopting ISO9000	Scoring (in average)	Rank	*t*-test Significant
Improve product quality	1.24	1	0.241
Competitor/market need	1.37	2	0.355
Corporate strategy/policy	1.53	3	0.015*
Company image	2.01	4	0.547
Improve operation performance	2.67	5	0.136
Improve employee capability	3.22	6	0.000*
Plan to implement TQM	3.54	7	0.002*
Self decision by one person	4.23	8	0.481

* Significant at 0.05 level.

In contrast with Erel and Ghosh [4] surveyed, the respondents were not intent to implement TQM approach. It can imply that most of the respondent concentrate on the market or business perspectives and corporate policy than improvement of their overall quality management activity. From directly interview with a few senior quality assurance and factory managers shown a view of the

marketability of company. As suppliers, it was that as well as the organizational value of holding a certification there was a distinct marketing benefit. In competitive world, the cost of not having registration was to lose their business. As customers, there was a strong view that the registration itself did not guarantee high standards.

4.2.3 The problems for adopting ISO9000:

The various problems faced by all respondents prior to implement ISO9000 series are exhibited in Table 3. The most common barriers for adopting ISO9000 after pushing by market and corporate policy are the perception of senior management staffs in customer requirement. They feel that although the competitors have implemented ISO9000 series but the customer still not require. The others important barriers are they did not know how to get start this project and some friction from staffs. Lack of qualified staffs is also important for adopting this standard.

Table 3 Problems for adoption of ISO9000

Problems for adopting ISO9000	Scoring	Rank	*t*-test Significant
Customers are not require	1.22	1	0.117
How to get start	1.27	2	0.259
Resistant from person	1.45	3	0.325
Lack of qualified person	2.02	4	0.237
High investment	2.45	5	0.341
Lack of confident	2.78	6	0.457

* Significant at 0.05 level.

4.2.4 Problems solving for adopting ISO9000:

To achieve these problems, we also survey the approaches from experience companies. We found that enforcement by top management, recruit the external consultant, and establish the training programs are always cited by respondents. Because of these demands, it led to an increasing the number of consultancy services companies and training organizations. In addition, the result of *t*-test shows that most SME more hire an external consultant than large company. It may be the fact that SME doesn't have enough their owned capable project leader or project team to implement this standard. Summarized is exhibited in Table 4.

4.3 Implementation of ISO9000

ISO9000 project management

To achieve the ISO9000 registration, 73.68% of the respondents used the outside consultants. By using *Chi-Square* test (cross-tabulation at 0.05), the result indicates that most SME hire consultant more than large company. The average time spend is less than 1 year (51.35%) and between 1 - 1.5 years (15.38%). The rest of them did not recruit an external consultant. They take more than 1.5 years (30.77%). These finding imply that if the companies use an external consultant, the project can be done effectively. However, there is 1 respondent who did not recruit an external consultant but achieve the project less than one year. The analysis of other factors such as an existing system and organizational structure, the human resources capability, management support, etc. should be carefully investigated. The result also indicates that 50% of respondent have partially changed their existing organization structure.

Table 4 Problems solving

Problems solving for adopting ISO9000	Scoring	Rank	*t*-test Significant
Enforcement by top management	1.74	1	0.117
Recruit an external consultant	1.82	2	0.015*
Outside and in-house training	1.96	3	0.325
	2.14	4	0.237

* Significant at 0.05 level.

About the project leader, top management, factory or production manager of all respondent are nominated to be the quality management representative instead of quality assurance or quality control manager. This finding show that all of the respondents have a strongly commitment of management that are complied with the requirements of this standard (clause 4.1.4). This is one of the most important factors for implementing ISO9000 series. Table 5 is the summarization of this section.

Further more in Table 6, the result indicates that that project leader is the most important factor in reducing the time of project. Having a strong senior management support and the contribution of external consultant also has a positive effect on implementation time. This finding is similar to the previous studied [4][7][9].

Table 5 Project management

Project management	Cross-tabulation analysis	Company size	
		SME	Large company
Hired consultant (84 companies)	% within Hired consultant	95.24%	4.76%
	% within Company size	81.63%	25%
None (30 companies)	% within None	60%	40%
	% within Company size	18.32%	75%

Significant *Pearson Chi-Square* 2-sides at 0.05 (Value = 7.313, *df* = 2, 0.023)

Table 5 Project management (continue)

Project period in average (years)		QMR
Hired consultant (84 companies)	None (30 companies)	Factory/ Production Manager (68.24%)
51.35% (< 1) 15.35% (1-1.5) 33.30% (> 1.5)	30.77 (> 1.5)	QA/QC Manager (31.76%)

Table 6 Positive factors

Factors	Scoring	Rank	*t*-test Significant
Project leader	1.21	1	0.112
Strong senior management	1.25	2	0.135
Contribution of consultant	1.34	3	0.201
Contribution of HR department	1.36	4	0.117
Well-structure of operatio	1.45	5	0.211
Communication	1.73	6	0.214
Team work	2.04	7	0.236
Employees motivation	2.76	8	0.205

* Significant at 0.05 level.

Table 7 Negative factors

Factors	Scoring	Rank	*t*-test Significant
Lack of management support	1.19	1	0.115
Lack of qualified staffs	1.27	2	0.117
Poor project leader	1.30	2	0.121
Low employees motivation	1.42	3	0.224
Poor communication	1.44	4	0.223
Well-structure of operation	1.88	5	0.212
Personal conflict	2.09	5	0.217
Low performance of consultant	2.25	6	0.116
Limitation of QC experiences	2.68	7	0.118
Lack of financial support	2.87	8	0.129

* Significant at 0.05 level.

In contrast in Table 7, lack of management support, qualified staffs and inefficient project leader is the negative factors for implementation. In addition, some respondents also cite the communication within organization (vertical and horizontal) as the important factors.

4.4 Post-implementation of ISO9000 series

The benefits of the ISO9000 registration

By setting up the system procedures to ensure that organization meet its customer requirements, many authors [3][5] suggest that an organization can improve it internal efficiency. It can also ensure better use of its time and resources, improve the consistent products or services quality, eradicate the need for rework or scrap and reduce cost of quality. There was general agreement that the main benefits came from the process of developing the quality management system to meet the associated requirement of the appropriate standard. Many of the respondents agreed that by using the attainment of ISO9000 series, as the vehicle on which to review their process, the major benefits were already realized before final assessment and certification. Table 8 shows an internal change after certified. Clearly and systematically in operation as well as strongly and continually management support are the most important effect.

Table 8 Internal changes

Factors	Scoring	Rank	*t*-test Significant
Clearly and systematically	1.17	1	0.134
Management support	1.88	1	0.113
Decrease quality problems	2.01	2	0.117
Employees capabilities	2.26	3	0.105
Team work	2.39	4	0.206
Better training system	2.42	4	0.189
Personal responsibility	2.51	5	0.102

* Significant at 0.05 level.

The external changes due to the ISO9000 registration are related to the organization's business. It is not only effected to their customer but also their suppliers. This finding shows that responsiveness to the customer need and image of the company is the most important positive change while the quality of their suppliers is also mentioned. Finally for the measurement of ISO9000 effectiveness, level of system nonconformities comparing between standard requirement and operation procedures are the most frequently measured. The level of product nonconformity and customer complain are also used by top management to monitor an existing system during the management review meeting. Table 9 exhibits this finding.

Table 9 Effectiveness measurement of ISO9000

Measures	Scoring	Rank	*t*-test Significant
Level of system non-conformity	2.01	1	0.214
Level of products non-conformity	2.27	2	0.378
Level of customer complain	2.34	3	0.225
Cost of quality	2.75	4	0.306
Commercial advantages	2.88	5	0.311

* Significant at 0.05 level.

5. Conclusions

From this survey, this study can rest some lessons to learn. Firstly, most of the automotive parts/components manufacturing companies have decided to adopt ISO9000 by the market driven need and improve the quality level (for both SME and large company). To facilitate this system, most of respondents have implemented 5s activity. The most important factor for adoption is the strong commitment of top management. Secondly, the consultant (especially for SME), top management involvement and qualified staffs play as a key factor for implementing. Finally, the quality performances are always used to evaluate the effectiveness of ISO9000 registration for both SME and large company.

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