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QUALITY MANAGEMENT FROM QA TO TQM IN THE HONG KONG CONSTRUCTION INDUSTRY

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ABSTRACT

In Hong Kong, construction quality management is on its way changing from QA culture to TQM culture. Investigations for finding quality management's cultural change from QA to TQM of construction contractors were carried out in 2007 and 2012 by using a set of questionnaire. The findings indicated that although a slight advancement in these five years has been observed, people work for the Hong Kong construction contractors are still not too familiar with TQM principles.

Keywords: Construction, Hong Kong, quality management, QA, TQM.

1. INTRODUCTION

Quality management is a crucial element of the successful management of construction projects (Abdul-Rahman 1997). According to Tang *et al.* (2005), there are two most important types of quality management systems used nowadays, quality assurance (QA) and total quality management (TQM).

QA is based on the principle that prevention is better than cure and it is more economical to get things right in the first place. Everyone should aim at doing things right the first time and every time, thus achieving zero defect in performance (Low and Teo 2004). The ISO 9000 series of the International Organization for Standardization is a quality standard for quality assurance (QA) purposes (ISO 1994). The latest version of the ISO 9000 was issued in 2008 (Dawson 2008).

TQM is defined as the management philosophy and company practices that aim to harness the human and material resources of an organization in the most effective way to achieve the objectives of the organization (BSI 1992). TQM is a management-led process to obtain the involvement of all employees, in the continual improvement of the performance of all activities, to meet the needs and satisfaction of both the internal and external customers (Tang *et al.* 2003). TQM is a higher level of quality management system than QA. The practice of QA usually serves as a stepping stone for the ultimate implementation of TQM.

Quality management system for construction projects based on ISO 9000 series have been implemented in many parts of the world in recent years, and particularly in the past twenty years or more in Singapore and Hong Kong (Tang *et al.* 2004). Now is probably the time for these two places to have a change – from QA culture to TQM culture. Studies are being done on this subject in Hong Kong.

2. OBJECTIVE AND METHODOLOGY

In 2007, investigations on the change from QA to TQM cultures in Hong Kong for engineering consultants (Tang and Lau 2009) and for construction contractors (Lau and Tang 2009) were carried out using two sets of survey questionnaires, one set for engineering consultants and the other set for construction contractors.

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In 2012, the set of questionnaire used in 2007 for surveying construction contractors was again used with the objective of gauging the contractors once more at a time five years after 2007. The Appendix shows the questionnaire used in the survey. It has two parts – Part 1 is related to questions about QA and Part 2 to questions about TQM.

This paper reports the observations found on the differences between 2007 and 2012 situations on the advancement of QA to TQM for construction contractors in Hong Kong.

3. SURVEY RESULTS

3.1. The respondents

In the 2007 survey, 40 completed questionnaires were received from 100 sent out, which represent a return rate of 40%. The size of the organizations in which the respondents were working varied from 50 staffs to more than 500 staffs. Amongst the organizations, more than half (60%) were larger than 500 employees in size. The type of construction work executed by the organizations in which the respondents were working were building works focused, civil works focused and a mixture of building and civil works. When all respondents are considered as a whole, 20% emphasized in building construction, 15% focused on civil construction and the remaining 65% executed both building and civil works (Lau and Tang 2009). 97% of the companies of the respondents were ISO 9000 certified.

In 2012, a total of 120 questionnaires were sent out, and 47 completed questionnaires were received. The response rate was 39.2%. Among these respondents, 48.3% were from large-scaled companies (more than 500 staffs). 51.7% were involved in building works, 17.2% in civil works, and 24.2% were mixed construction contractors so that they execute both building and civil works. The remaining companies (6.9%) were classified as “other type of contractors” because they were E&M and fitting-out contractors (Chen 2012). 100% of the companies of the respondents were ISO 9000 certified. This indicated that Hong Kong construction contractors are mature in implementing QA systems in line with the ISO 9000 Standard

3.2 Part 1 (QA) results

The average of the scores assigned by the respondents against each questionnaire item is defined as the respondent averaged score of an item, with the score scale based on a 5-point Likert System (Hayes, 1998) – see Appendix. The 2007 respondent averaged scores for the 25 items of Part 1 are shown in Figure 1 (Source: Lau and Tang 2009).

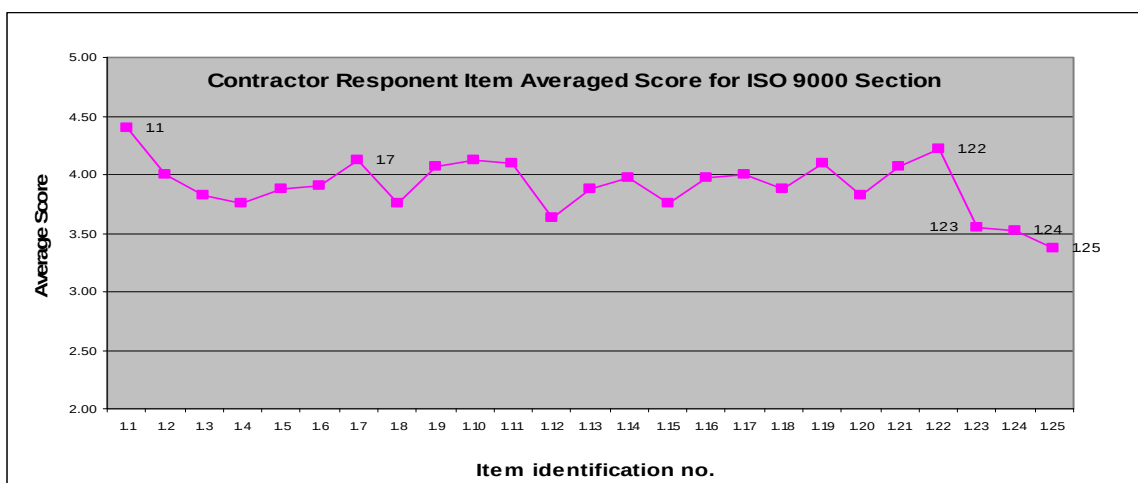


Figure 1: Responent averaged scores for the 25 Part 1 items (Year 2007)

The 2012 respondent averaged scores for the 25 items of Part 1 are shown in Figure 2 (Source: Chen 2012).

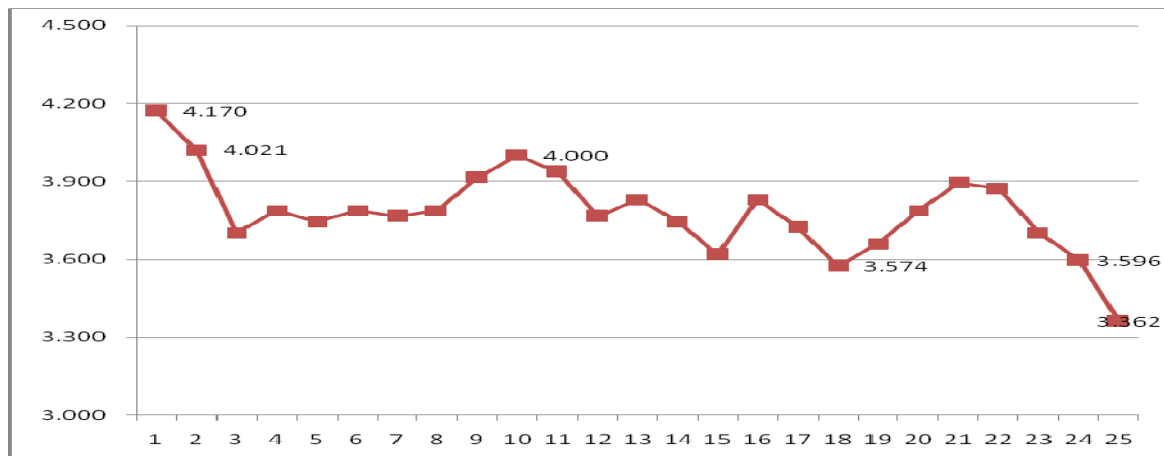


Figure 2: Respondent averaged scores for the 25 Part 1 items (Year 2012)

3.3 Part 2 (TQM) results

The 2007 respondent averaged scores for the 20 items of Part 2 are shown in Figure 3 (Source: Lau and Tang 2009).

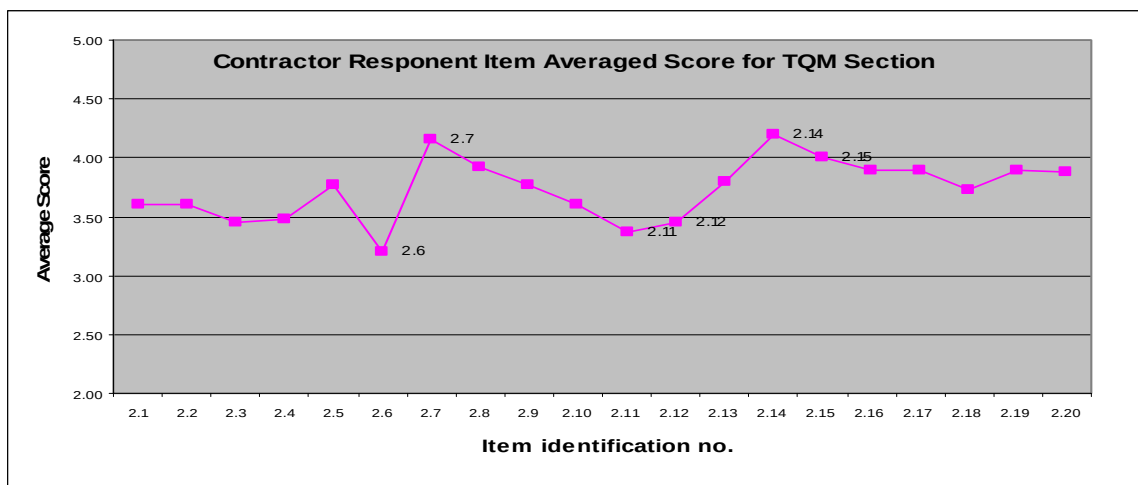


Figure 3: Respondent averaged scores for the 20 Part 2 items (Year 2007)

The 2012 respondent averaged scores for the 20 items of Part 2 are shown in Figure 4 (Source: Chen 2012).

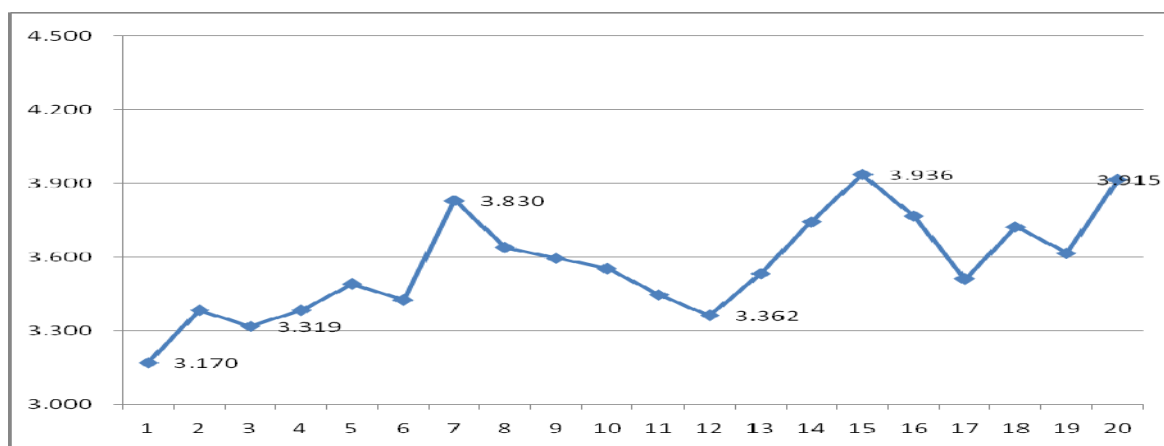


Figure 4: Respondent averaged scores for the 20 Part 2 items (Year 2012)

4. DISCUSSIONS ON THE RESULTS

4.1 The Question Worth Thinking

Most respondents considered that ISO 9000 was suitable for the construction industry so there was a high rate of ISO 9000 certification in the construction industry in Hong Kong. But does it mean a high quality of construction and a high awareness of total quality principles? It had been five year since the first survey conducted in 2007, and the second survey was conducted in 2012. During these years, were there any improvements in ISO 9000 implementation or any adoptions of TQM principles? The latest version of ISO 9000 which was published in 2008, containing a limited number of TQM elements, has become more popular and important in modern quality management. Did this help to a certain extent the quality of the contractors' works in the Hong Kong construction industry?

4.2 Comparison of 2007 and 2012 Results from Part 1 (QA) of the Questionnaire

In 2007, the three items with the lowest scores were Items 25 (3.375), 24 (3.525) and 23 (3.550). In 2012, the three items with the same were Items 25 (3.362), 18 (3.574) and 24 (3.596).

In 2007, the three items with the highest scores were Items 1 (4.400), 22 (4.225) and 7 (4.125). In 2012, the three items with the same were Items 1 (4.170), 2 (4.021) and 10 (4.000).

One could see the non-significant difference between the 2007 and 2012 situations, particularly if Figures 1 and 2 are compared; the two graphs have very similar shapes.

For the three low average score items in Part 1, the same lowest average score item (Item 25) was obtained from both surveys. Due to the existence of the Hong Kong Housing Authority's PASS system (Tang *et al.* 2005) and the Hong Kong Works Branch/Bureau Contractor's Performance Index, ISO 9000 is not popular for assessing contractor's performance in Hong Kong. The PASS reports are, however, used to favour qualification and tender assessments rather than to provide information for quality improvement. Item 24 is also one of the three lowest average score items in both the 2007 and 2012 surveys. The construction industry has a nature of its uniqueness. Construction projects are non-repeating. The unique nature of each and every project leads to the result that statistical techniques used in construction are less useful than that in manufacturing. The second lowest item in the 2012 survey is Item 18. Most of the respondents did not consider their companies' quality system as a tool for reviewing the disposition of non-conforming products. There could be three reasons. First, some companies may have another management system specifically for recording and reviewing non-conformances. Second, many non-conformances are detected and solved before a construction quality accident happens, so recording and reviewing non-conformance is considered less important by contractors. Third, respondents were unwilling to admit too many non-conformances for the reputation of their companies.

For the three highest average score items in Part 1, the same highest average score item (Item 1) was obtained from the two surveys. The ISO 9000 standard is always a guideline for almost all companies to achieve their quality objectives. Commitment and clear objectives are the prime requirements of the Standard. The concept that company managers commit their quality based on ISO 9000 has been deep-rooted. Item 2 which describes the responsibility of personnel in various quality related works has the second highest score in the 2012 survey. In the past, quality management could be considered as a matter only of a company's management or of those quality staffs. The TQM principle has a key element which requires all participants of a project to be involved in. A well-defined

quality structure is a good start of TQM implementation, and a well-defined responsibility structure is also a key to the success for a company. This item indicates that more and more companies focus on management, including total quality management. Item 10 that requires contractors to review drawings and specifications before permission is granted to construct has the third highest score (also the fourth highest score in the 2007 survey). It is worth saying that in the 2007 survey, Item 7 was the third highest, and this item is very similar to Item 10. The only difference is doing the same at different stages. Since reviewing tender documents in tendering stage is crucial to the success of bidding, it is also crucial for contractors to review drawings and specifications before construction.

4.3 Comparison of 2007 and 2012 Results from Part 2 (TQM) of the Questionnaire

In 2007, the three items with the lowest scores were Items 6 (3.200), 11 (3.375) and 12 (3.450). In 2012, the three items with the same were Items 1 (3.170), 3 (3.310) and 12 (3.362).

In 2007, the three items with the highest scores were Items 14 (4.200), 7 (4.150) and 15 (4.000). In 2012, the three items with the same were Items 15 (3.936), 20 (3.915) and 7 (3.830).

One could see the difference between the 2007 and 2012 situations, particularly if Figures 3 and 4 are compared; the two graphs have greater difference in shapes compared with those of the Part 1 questionnaire, but the difference is not large overall.

The item with the lowest score for Part 2 in the 2012 survey is Item 1. In the process of advancing from QA to TQM, some traditional concepts have still influenced people's thinking pattern. TQM advocates all participants' involvement, but traditionally, quality improvement has been the matter of decision-makers or quality departments' staffs. To foster an "all employee involvement" culture in the construction industry still has a long way to go. The item with the second lowest score is Item 3. This is also a problem related to "all participant involvement". Subcontractors/material suppliers are also key members of a construction project. Their performance directly affects the quality of construction. Due to the complexity of construction contracts, the quality policies / quality management systems / quality cultures which have been implemented well by main contractors are not always good when they are implemented by subcontractors / suppliers. For a main contractor, the effectiveness of its management on its external sub-let partners is a difficult problem. This causes TQM hard to be realized. The item with the third lowest score (Item 12) has the same ranking in the previous (2007) survey. The reason has been given by Lau and Tang (2009). Contractors are reluctant to initiate optimization issues with clients or their representatives in order to prevent unnecessary contractual disputes. The mentality of self-protection could be understood but is really an obstacle to TQM implementation.

Item 15 had the highest average score in the Part 2 (TQM) section in the 2012 survey. Actually this item was also the third highest item in the 2007 study. Offering reasonable explanations to client's complaints and then resolving problems successfully are key activities towards clients' satisfaction and continual improvement. They are two important elements for achieving TQM. Item 20 ranked second in this section. Most respondents felt positive about their companies' quality policy. This is a good phenomenon. No matter how excellent the quality management system is, it needs staffs to carry it out. If staffs feel reluctant and have no confidence in the quality policy, good quality is just a slogan. The third item with the highest score is Item 7, which also ranked second highest in the 2007 survey. There is no doubt about the importance of construction safety. Safety performance of previous works is a crucial indicator for clients to choose a contractor, so it is not surprising that contractors pay much attention on safety and workplace environment.

5. CONCLUSION

The research finding of 2012 showed a slight advancement compared with that of 2007. Furthermore, several observations are highlighted and discussed below.

Item 2 of Part 1 of the questionnaire was given high scores by the respondents. A well-structured quality system means a clear division of responsibilities on quality issues. Since all participants' involvement is a key to achieve TQM, the growing awareness of the importance of a company's quality system is a good sign.

The construction industry has its nature of uniqueness. Statistical method is therefore less useful than its usefulness in the manufacturing industry. Moreover, some QA elements used in the current quality system may not be suitable for the implementation of TQM. It is important to make it clear what items from the ISO 9000 Standard are suitable for the construction industry to have an effective quality management system for a company.

"Quality improvement" or "quality discussion" still seems to be a matter of contractors' top management or quality department staffs only. The maximum benefit of implementing TQM principle can be realized only if all people are involved. The current problems the main contractors are facing are how to introduce TQM to their subcontractors/suppliers, and how to restrict their behavior by a good quality management system.

To conclude, the process of advancing from QA to TQM will take many years. It is good to see that a better quality culture has been fostered gradually in Hong Kong. Such survey is recommended to be conducted periodically, covering also the subcontractors / suppliers.

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APPENDIX - QUALITY ASSURANCE QUESTIONNAIRE (Contractor)

The purpose of this questionnaire is to obtain detailed information of the existing quality system of your company, which is perceived to comply with the ISO 9001 standard. The questionnaire focuses on the application of the ISO 9000 and TQM quality management principles and the achievement of the intended quality management objectives.

Part 1: Application of the ISO 9000 quality management principles

Please respond to each of the items by circling the number you think best describes your company as it is today. Five (5) means that your company satisfies the criterion to a great extent. One (1) means that your company does not meet this criterion at all.

The quality management system maintained by your company / organization comprises the following:

	<i>Great extent</i>				<i>Not at all</i>
1.1 The company's objectives for quality and its commitment to quality.	5	4	3	2	1
1.2 Defined responsibility of personnel who manage, perform and verify work that affects quality.	5	4	3	2	1
1.3 A communication system notifying all staffs about the quality responsibilities of every individual (or party for activities undertaken by subcontractors or suppliers).	5	4	3	2	1
1.4 The adequate provision of appropriate resources for performance of work.	5	4	3	2	1
1.5 The appointment of a management representative for monitoring system performance and compliance with the ISO quality management standards.	5	4	3	2	1
1.6 Reviews on the system undertaken by top management at pre-defined intervals.	5	4	3	2	1
1.7 Comprehensive review of the tender document prior to technical and commercial submissions.	5	4	3	2	1
1.8 Procedures to record contract variations efficiently and to correctly transfer variation information to the function teams concerned.	5	4	3	2	1
1.9 Procedures to control the design of temporary and permanent (as required by the contract) works.	5	4	3	2	1
1.10 Review of drawings and specifications prior to authorization for construction.	5	4	3	2	1
1.11 Effective access to obtain the latest construction drawings and specifications.	5	4	3	2	1
1.12 Assessment of subcontractors for their ability to meet the subcontract requirements including commercial, statutory and technical aspects prior to selection.	5	4	3	2	1
1.13 Testing and inspection of incoming products for specification compliance.	5	4	3	2	1
1.14 Process flow chart and inspection & test plan (ITP) for activities that directly affect quality.	5	4	3	2	1
1.15 Identification system for components of the finished work.	5	4	3	2	1
1.16 Final inspection and test plan including checklist upon completion of the construction project or a predetermined stage of the work.	5	4	3	2	1
1.17 Control measures for ensuring the inspection and test equipment is capable of the necessary function and accuracy.	5	4	3	2	1
1.18 Documented procedure for reviewing the disposition of non-conforming products.	5	4	3	2	1
1.19 Documented procedure for implementing corrective and preventative actions.	5	4	3	2	1
1.20 Documented procedure for handling, storing and preserving raw materials and finish products.	5	4	3	2	1
1.21 Systematic filing and accessing procedures to enable efficient quality record retrieving.	5	4	3	2	1
1.22 Periodic internal auditing of the system by independent personnel to ensure effectiveness of the quality system.	5	4	3	2	1
1.23 Identification and provision of required training for staffs who are involved in activities directly affecting quality.	5	4	3	2	1
1.24 Identification and application of statistical technique required for verifying process capability and product characteristics for repeating items (e.g. doors, windows, facades, concrete batches, re-bar batches, pipe and pile welding, soil compaction).	5	4	3	2	1
1.25 Scheduled survey for assessment of client's satisfaction.	5	4	3	2	1

Part 2: Application of Total Quality Management elements which have not been included in Part 1 of the Questionnaire

Please respond to each of the items by circling the number you think best describes your company as it is today. Five (5) means that your company satisfies the criterion to a great extent. One (1) means that your company does not meet this criterion at all. There may be occasions when a few questions in Part 2 appear to be similar to those in Part 1, the purpose of these appearing similar questions is to investigate in depth the difference between quality assurance and total quality control.

The quality management system and quality culture maintained in your company / organization comprises the following:

					<i>Great extent</i>				<i>Not at all</i>
2.1	Policies to encourage all employees to participate in quality improvement discussions.	5	4	3	2	1			
2.2	Practices to encourage project quality improvement discussions at internal site staff meetings.	5	4	3	2	1			
2.3	Practices to encourage process quality improvement discussions at subcontractor / trade contractor site meetings.	5	4	3	2	1			
2.4	Policies to encourage process optimization discussions during early construction planning, based on best methods and appropriate resources.	5	4	3	2	1			
2.5	Policies to ensure prompt review on processes to account for design changes during construction.	5	4	3	2	1			
2.6	Employees are introduced the principles and tools for total quality management at project commencement, in addition to contract specifications.	5	4	3	2	1			
2.7	Practicing continual review on construction safety and work place environment with a view for improvement.	5	4	3	2	1			
2.8	Practicing continual review on process completion time with a view for improvement.	5	4	3	2	1			
2.9	Practicing continual review on process costs with a view for improvement.	5	4	3	2	1			
2.10	Employees feel the top management provides full support to process and project quality improvement.	5	4	3	2	1			
2.11	Conducting value engineering workshops with the Client at project commencement in order to highlight potential cost or time saving proposals.	5	4	3	2	1			
2.12	Policies for regularly reviewing the Client's project priorities.	5	4	3	2	1			
2.13	Explaining the proposed construction processes to the Client prior to construction commencement.	5	4	3	2	1			
2.14	Responding quickly to the Client's enquiries and complaints.	5	4	3	2	1			
2.15	Offering reasonable explanations and solutions to legitimate complaints.	5	4	3	2	1			
2.16	Establishing courteous attitude and efficient communication with the Engineer and Client.	5	4	3	2	1			
2.17	Establishing courteous attitude and efficient communication with subcontractors and suppliers.	5	4	3	2	1			
2.18	All internal and external quality audits are considered as constructive tools for improvement, but not solely as specific controls for system compliance.	5	4	3	2	1			
2.19	Most (more than 90%) of the activities pass the client's inspection without re-work.	5	4	3	2	1			
2.20	Employees feel positive about the company's quality policy.	5	4	3	2	1			